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Fishing Capacity Management for Sustainable Fisheries in Thailand

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Fishing Capacity Management for Sustainable Fisheries in Thailand

A thesis submitted in fulfillment of the
requirements for the award of the degree

Doctor of Philosophy

from

University of Wollongong

by

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University of Wollongong

August 2015

CERTIFICATION

I, **Pakjuta Khemakorn**, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Australian National Centre for Ocean Resources and Security (ANCORS), Faculty of Law, Humanities and the Arts, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Pakjuta Khemakorn

28 August 2015

ABSTRACT

Overcapacity has been a global concern in fisheries for many decades as it has created one of the most severe impacts on fisheries stocks. It is commonly found in fisheries with open access system, limited regulations and inadequate controls on fishing capacity. Although the awareness of controlling fishing capacity is significantly growing worldwide, the problem of overcapacity is unlikely alleviated. It is due to a number of factors, including the lack of understanding of the concepts of fishing capacity and relevant terms, the lack of property user rights in fisheries and the inadequacy of effective management to address excess capacity and/or overcapacity issues based on the international standards. Thailand is one of the coastal States confronted with problems of overcapacity, and it has become the main obstacle for Thailand to achieve the sustainable fisheries.

This thesis clarifies the concepts of capacity in fisheries and examines the issue of overcapacity both in Thailand and global level. The criteria derived from the international and regional fisheries instruments to manage fishing capacity and address excess capacity and/or overcapacity problems are also determined and used as a basis to evaluate the adequacy of current legal, institutional and technical management frameworks for managing fishing capacity of Thailand.

Based on the analysis, the failure of fishing capacity management currently conducted by Thailand suggests the inadequacy of framework necessarily adopted to effectively manage fishing capacity and address overcapacity problem in Thailand. Gaps and challenges in managing fishing capacity are therefore identified. The lack of comprehensive legal and policy framework is found as one of the significant gaps, and the complexity of the nature of Thai fisheries (multi-gear and multi-species) is one of the big challenges confronted by Thailand in managing its fishing capacity. The thesis lastly provides options and recommendations for Thailand to address such gaps and challenges in order to achieve the effective management of fishing capacity for sustainable fisheries.

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AD	Anti-Dumping
ACE	annual catch entitlements
AFMA	Australian Fisheries Management Authority
AOP	Australia's Oceans Policy
APFIC	Asia-Pacific Fishery Commission
ARFMM	ASEAN Regional Fisheries Management Mechanism
ASCM	Agreement on Subsidies and Countervailing Measures
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Agency for International Development
B.E.	Buddhist Era
BMSY	Biomass that can support MSY
BOBP	Bay of Bengal Programme
CAY	current annual yield
CBFM	Community-based fisheries management
CCAMLR	Commission on the Conservation of Antarctic Marine Living Resources
CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
CCRF	The 1995 Code of Conduct for Responsible Fisheries
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CFP	EU Common Fisheries Policy
CFR	cost and freight
CHARM	Coastal Habitat and Resources Management
COFI	Committee on Fisheries
CPCs	Contracting Parties and Cooperating Non-Contracting Parties
CPUE	catch per unit of effort
CRM	coastal resources management
DAFF	Department of Agriculture, Fisheries and Forestry
DEA	data envelopment analysis
DOF	Department of Fisheries
DWF	distant water fishing
DWFNs	distant water fishing nations

EAF	ecosystem approach to fisheries
EBFM	ecosystem-based fishery management
EBFMP	ecosystem-based fishery management plans
EBM	ecosystem-based management
EC	European Community
EEZ	exclusive economic zone
EU	European Union
EwE	Ecopath with Ecosim
FADs	fish aggregating devices
FAO	Food and Agricultural Organisation
FAO-RAP	FAO Regional Office for Asia and the Pacific
FCAc	Fishery Cooperative Associations
FIGIS	Fisheries Global Information System
FIRMS	Fishery Resources Monitoring System
FMAs	fisheries management areas
FMOs	fishery management organisations
FMSP	Fisheries Management Science Programme
FoFs	Friends of Fish
FQA	fixed quota allocation
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GFTs	government financial transfers
GIS	geographic information system
GOT	Gulf of Thailand
GSI	Global Subsidies Initiative
GT	gross tonnage
HDR	Human Resources Development
HSVAR	High Seas Vessel Authorization Record
IATTC	Inter-American Tropical Tuna Commission
ICA	International Cooperative Alliance
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICFM-PD	integrated coastal fisheries management in Pathew District

ICFO	International Cooperative Fisheries Organisation
IEQ	individual effort quotas
IFQ	individual fishing quota
IGOs	international governmental organisations
IISD	International Institute for Sustainable Development
IOTC	Indian Ocean Tuna Commission
IPHC	International Pacific Halibut Commission
IPOA-Capacity	International Plans of Action for the Management of Fishing Capacity
IPOA-IUU	International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing
IQs	individual harvest quotas
ITQs	individual transferable harvest quotas
IUU	illegal, unreported, and unregulated
IWC	International Whaling Commission
kW	kilo watts
LDC	least-developed country
LME	Large Marine Ecosystem
LOSC	United Nations Convention on the Law of the Sea
LTPY	long-term potential yield
LVFO	Lake Victoria Fisheries Organisation
MCS	monitoring, control, and surveillance
MCY	maximum constant yield
MEY	maximum economic yield
MoU	memorandum of understanding
MPA	marine protected area
MPI	Ministry for Primary Industries
MRI	marine research institute
MSBE	multispecies bioenergetics models
MSP	multispecies production models
MSVPA	multispecies virtual population analysis
MSY	maximum sustainable yield
MT	metric ton
NAFO	Northwest Atlantic Fisheries Organisation

NASCO	North Atlantic Salmon Conservation Organisation
NEAFC	North East Atlantic Fisheries Commission
NGOs	International Governmental Organisations
NHRC	National Human Rights Commission of Thailand
NMFS	National Marine Fisheries Service
NOAA	US National Oceanic and Atmospheric Administration
NPAFC	North Pacific Anadromous Fish Commission
NPF	Northern Prawn Fishery
NPOA	National Plan of Action
NRSMPA	National Representative System of Marine Protected Areas
OECD	Organisation for Economic Co-operation and Development
PFC	Provincial Fisheries Committee
PFG	Pakklong Fisheries Group
POs	Producers Organisations
QMA	quota management areas
QMS	quota management system
RA	rapid appraisal
RBFM	right-based fisheries management
RFBs	regional fishery bodies
RFMOs	regional fisheries management organisations
RPOA	Regional Plan of Action
RSAC	Regional Scientific Advisory Committee
SBF	Swedish Board of Fisheries
SC	Scientific Committee
SCM	Subsidies and Countervailing Measures
SCRS	Standing Committee on Research and Statistics
S&DT	special and differential treatment
SEAFDEC	Southeast Asian Fisheries Development Center
SEAFO	Southeast Atlantic Fisheries Organisation
SEF	South East Trawl Fishery
Sida	Swedish International Development Cooperation Agency
SIOFA	South Indian Ocean Fisheries Agreement
SPF	stochastic production frontiers

SPRFMO	South Pacific Regional Fisheries Management Organisation
SQ	sectoral quota
TAC	total allowable catch
TACC	total allowable commercial catch
TAO	Tambon Administrative Organisation
TCP	The Florida spiny lobster trap certificate program
TH	Thailand
THB	Thai baht
TTOFIC	Thai Tuna Oceanic Fishery Cooperative
TURFs	territorial use rights in fisheries
UK	United Kingdom
UN	United Nations
UNCLOS	United Nations Conference on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
USA	United States of America
USD	United States dollar
VMP	vessel buy program
VMS	vessel monitoring system
VPUE	value per unit of effort
WCPFC	Western and Central Pacific Fisheries Commission
WPFC	working party on fishing capacity
WTO	World Trade Organisation
WWF	World Wildlife Fund

CHAPTER 1 INTRODUCTION

Introduction

In the past decades, overcapacity has become a great concern in global fisheries.[1] Overcapacity is a result of the lack of property user rights in fisheries.[2] Overcapacity is a classic problem found in any common pool resource fisheries[3] where fishers attempt to maximise their personal gain from fishing.[4] Despite the growing global awareness in controlling fishing capacity, the magnitude of the problem of overcapacity continues to increase.

Overcapacity primarily results from the fact that many States have not yet adopted and/or implemented adequate management frameworks for fishing capacity management at the national level. The key factors contributing to this inadequacy include the lack of clear understanding of the concepts of fishing capacity, overcapacity, and the need to address them, taking into account various circumstances. Thailand, being one of the top global fisheries producers in the world faces the serious, longstanding, and worsening problem of overcapacity due to the open access nature of its fisheries. This thesis responds to this issue by reviewing the overcapacity problem in Thailand and examining the legal, policy and institutional gaps and challenges in managing fishing capacity in Thailand based on international and regional benchmarks. Lastly, options and recommendations to effectively manage fishing capacity towards sustainable fisheries in Thailand are presented.

This introductory chapter provides the context for the thesis by discussing the fundamental principles related to fishing capacity, as well as by analysing the global concerns about overcapacity and how this relates to Thailand. The Chapter outlines how the thesis will be developed in the succeeding chapters and further provides the

[1] Indrani Lutchman and Daniel D Hoggarth, *Net Losses: Untying the Gordian Knot of Fishing Overcapacity* (IUCN, 1999) 2; FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2004* (FAO, 2004) 118.

[2] FAO, *Regulating Fishing Capacity* (27 May) FAO <http://www.fao.org/fishery/topic/14857/en>.

[3] Carsten Lynge Jensen, 'Reduction of the Fishing Capacity in "Common Pool" Fisheries' (2002) 26(3) *Marine Policy* 155.

[4] Colin W Clark, The Worldwide Crisis in Fisheries Economic Models and Human Behavior (Cambridge University Press, 2006) 3.

objectives, the scope and limitation, and the significance of the thesis. The analytical framework used in the discussion of the legal and policy measures to promote effective fishing capacity management is also explained in this chapter and further elaborated in succeeding parts of the thesis.

1.1 Fundamental Principles of Capacity in Fisheries

The concept of 'capacity' in the fisheries context can be difficult to define and understand due to the complex of attributes of fishing units' productivity. By way of explanation, this section examines the term 'fishing capacity' and other relevant key concepts such as excess capacity, overcapacity, overfishing, fishing capacity, capacity utilisation and overcapitalisation.

1.1.1 Fishing Capacity

'Capacity' is referred to as the maximum of potential production by a producing unit, company, or industry, given production factors (e.g. capital stock, technology).[5] In general terms, 'capacity' in a company or industry, for instance, is normally defined as the capability of the company or industry to carry a flow of goods and/or services per period of time.[6] This concept is much broader and slightly different from the term 'fishing capacity', which is not clearly defined in literature, and hence has been understood and characterised by fisheries scientists, fisheries economists, and fisheries managers in various ways[7] based on their own concerns.[8] For example, the technologists usually define the capacity of a vessel as its technological and practical capability to achieve an expected level of activity. It can be fishing days, catch or products from the processing. Fisheries biologists usually connect capacity with fishing effort and the derivable fishing mortality rate, which is the ratio of the number of deaths of a particular

[5] Sean Pascoe et al, Measuring and Assessing Capacity in Fisheries: 2. Issues and Methods (FAO, 2003) 8.

[6] Investopedia, *Capacity* <http://www.investopedia.com/terms/c/capacity.asp>.

[7] John M Ward et al, *Measuring and Assessing Capacity in Fisheries: 1. Basic Concepts and Management Options* (FAO, 2004) 2.

[8] James E Kirkley and Dale Squires, 'Measuring Capacity and Capacity Utilisation in Fisheries' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper (FAO, 1999) vol 386, 206.

fish stock within a fishing period.[9] The fishing effort theoretically refers to total inputs used in the fishing process. In general, measuring these inputs is not feasible, so substitute measures or indicators are applied, for example, total fishing days and the number of fishing gears used.[10] This approach is then related to the relationship between the effort measured (e.g., fishing days) and fishing mortality (i.e., catch). In case the fishing mortality is beyond the desired target level, which is normally a biological reference point, such as the Maximum Sustainable Yield (MSY) or alternate precautionary reference point, the rate of fishing mortality is therefore too high due to too much fishing effort. In this sense, if the fishing effort can be controlled as at a balanced level with the target rate of fishing mortality by using law enforcement, the capacity problem is not appeared.[11]

The views of fisheries managers about fishing capacity is generally similar to that of fisheries scientists, but they often link fishing capacity to the number of fishing vessels in the fishery. This perspective is generally found in the fishery that is governed by input controls, such as fleet size limitation.[12] However, capacity can also be demonstrated as gross tonnage, or the total of fishing effort, such as days of fishing, and sometimes the vessel utilisation rate.[13]

Economists, on the other hand, tend to define fishing capacity as the potential output that could be produced at maximum profit level (an output perspective)[14] with given levels of inputs, e.g., vessel size, engine horsepower, fuel, number of fishing gears, ice and bait.[15] From an economic viewpoint, fishing capacity will be affected by several factors, such as price of fish, physical productivity and limitations of the market.[16]

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[9] FAO Fisheries and Aquaculture Department, above n 1; Ward et al, above n 7, 9; Kirkley and Squires, above n 8; OECD, *Review of Fisheries in OECD Countries: Policies and Summary Statistics 2001* (OECD Publishing, 2001) 57.

[10] Ward et al, above n 7, 9; OECD, *Review of Fisheries in OECD Countries: Glossary* (OECD, 1998).

[11] Ward et al, above n 7, 9.

[12] FAO Fisheries and Aquaculture Department, above n 1; Ward et al, above n 7, 2; Peter N Ehlers et al (eds), *Marine Issues: From a Scientific, Political and Legal Perspective* (Martinus Nijhoff, 2002) 190.

[13] FAO Fisheries and Aquaculture Department, above n 1; Ward et al, above n 7, 9.

[14] FAO Fisheries and Aquaculture Department, above n 1, 119; Ward et al, above n 7, 3.

[15] FAO, *Different Perspectives on Fishing Capacity* FAO <http://www.fao.org/fishery/topic/14856/en>.

[16] OECD, Review of Fisheries in OECD Countries: Policies and Summary Statistics 2001 (OECD Publishing, 2001) 56.

These perspectives or concepts have different implications for fisheries management. For instance, based on the viewpoint of fisheries scientists, if fishing vessels operate for a less number of fishing days, the level of fishing effort will therefore reduce and overcapacity issue would be gone. For fisheries managers, the problem will still remain because the number of fishing vessels is not decreased. From an economist's standpoint, however, the situation will be worse since reduced utilisation could result in lower profitability. Conversely, if the number of fishing vessels is reduced, which results in directly decreasing capacity from the fisheries manager's perspective, the fishing effort level will be reduced as well. This would satisfy fisheries scientists. Since the remaining fishing vessels will more efficiently operate due to the reduced size of fishing fleet, capacity problem is also diminished according to the viewpoint of economists. While different considerations are taken into account depending on perspective, it can be seen that the different views towards capacity are not always inconsonant; in fact they can support each other.[17]

Since fishing capacity can be defined in many ways, in order to capture various views of fishing capacity, the Food and Agriculture Organisation of the United Nations (FAO) has defined fishing capacity as:

> 'Fishing capacity is, for a given resource condition, the amount of fish (fishing effort) that can be produced over a period of time (e.g., a year) by a vessels or a fleet if fully utilized. That is, if effort and catch were not constrained by restrictive management measures.'[18]

In terms of fishing vessels, fishing capacity is defined as its capability, or power, to create the fishing effort per a time period.[19] Hence, the factors comprising a fleet's capacity may be divided into four components, i.e., (i) the number of vessels, (ii) the

[17] Ward et al, above n 7, 3.

[18] This definition has been agreed by participants of FAO Technical Consultation Meeting on the Measurement of Fishing Capacity held in Mexico in 1999. See, FAO, 'Technical Consultation to Review Progress and Promote the Full Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing and the International Plan of Action for the Management of Fishing Capacity, Rome, 24-29 June 2004' (FAO Fisheries Report No. 753, FAO, 2004) 6.

[19] Dominique Greboval and Gordon Munro, 'Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper No. 386 (FAO, 1999) 206, 2.

vessel size, (iii) the technical competency of fishing operation of the vessel, and (iv) the fishing time potentially spent by a vessel, per a time period.[20]

To fully understand the concept of capacity, it is essential to clarify the two related concepts of excess capacity and overcapacity.

1.1.1.1 Excess Capacity

Excess capacity is characterized by the level of the output potentially achieved relative to the output actually achieved in a certain period of time.[21] In general, excess capacity is referred to the difference between the maximum output potentially achieved and the output actually achieved. The maximum output is the output that can be produced, conditioned by factors such as the present status of resources, technology, full and effective use of the capital stock, and other various factors.[22] Put simply, excess capacity occurs when the level of potential catch or effort is above the level of observed catch or effort in a period of time.[23]

Excess capacity is considered as a short-term problem, which can correct itself, since fishers are capable to change the use of their inputs or outputs in the short term.[24] Excess capacity can be found when the changes of supply and demand create the imbalance of the market. The market can, however, adjust its capital and other inputs in order to increase or reduce the production[25] and then achieve the market equilibrium.
Examples of these are lower prices of fish or temporarily increased costs of production (e.g., due to higher price of fuel), which may cause fewer fishing days of vessels than average fishing days under normal situations. When these fish prices and production costs come back to normal level, the form of excess capacity may be subsequently corrected by itself.[26]

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[20] Courtland L Smith and Susan S Hanna, 'Measuring Fleet Capacity and Capacity Utilisation' (1990) 47 *Canadian Journal of Fisheries and Aquatic Sciences* 2085, quoted in Greboval and Munro, above n 19.

[21] FAO Fisheries and Aquaculture Department, above n 1, 119; Pascoe et al, above n 5, 14.

[22] Ibid.

[23] Ward et al, above n 7, 4; Robert S Pomeroy, 'Managing Overcapacity in Small-scale Fisheries in Southeast Asia' (2012) 36(2) (3//) *Marine Policy* 520, 521.

[24] Ibid.

[25] Pascoe et al, above n 5, 14.

[26] Ward et al, above n 7, 4.

Excess capacity can also be caused by the application of some management measures. For instance, the programs of fish stock recovery that apply the limitation on the catch or fishing effort may create the underutilisation of fishing vessels during the operation of these programs, but when the fish stocks have improved, such fishing vessels are then allowed to fully operate. Under this condition, the occurrence of excess capacity may not be determined as an issue. Additionally, excess capacity can be an indicator of overcapitalization, which is a longer term problem in fisheries.[27] The concept of excess capacity can be compared and contrasted with the concept of overcapacity.

1.1.1.2 Overcapacity

Overcapacity is considered as the main concern for resource managers as it could cause consequences in many aspects, including biological, economic, social and political aspects.[28] Overcapacity is referred to the difference between the maximum potential output and a desirable level of the optimum output,[29] such as the MSY[30] or the Maximum Economic Yield (MEY).[31] Simply put, overcapacity is a symptom of open access or common property fishery management.[32] It is sometimes described as

[27] Greboval and Munro, above n 19; Ward et al, above n 7, 4.

[28] FAO, Fisheries Management: 3. Managing Fishing Capacity (FAO, 2008) 7-8.

[29] Pomeroy, above n 23. This is based on output perspective. For input perspective, on the other hand, overcapacity can be described as 'there is more than the minimum fleet and effort required to produce a given TAC or given output (harvest catch) level.' See, FAO, above n 15.

[30] The MSY is considered as the average of the maximum catch or yield that can sustainably be harvested from a fish stock under current conditions of environments. Additionally, the MSY can be referred to as 'maximum equilibrium catch; maximum sustained yield; sustainable catch.' See, NOAA's National Marine Fisheries Service: Northeast Fisheries Science Center, *Definition of Fisheries Technical Terms* (24 November 2004) <http://www.nefsc.noaa.gov/techniques/tech_terms.html>. Alternatively, the MSY may be defined as the maximum catch level that can be sustainably exploited. See, Susan Singh-Renton, *Introduction to the Sustainable Development Concept in Fisheries* FAO <http://www.fao.org/docrep/005/y4260e/y4260e0r.htm#bm27>. Additionally, if a fish stock is harvested beyond its MSY level, such stock is basically determined as an overfished stock. See, Ward et al, above n 7, 5.

[31] Since the MSY concerns resource sustainability, it only primarily takes into account a biological viewpoint. However, fisheries economists have argued that the benefits in terms of economy must also be considered as fishing is a business. In order to serve this perspective, the Maximum Economic Yield (MEY) has been developed as another reference point. The MEY is determined by properly adjusting the difference between the fishing cost and the received income, and is usually found at a lower level of fishing effort than those needed for harvesting the MSY. See, Singh-Renton, above n 30.

[32] Martin Aranda, Hilario Murua and Paul de Bruyn, 'Managing Fishing Capacity in Tuna Regional Fisheries Management Organisations (RFMOs): Development and State of the Art' (2012) 36(5) (9//) *Marine Policy* 985, 986.

overcapitalisation in harvesting fish for a number of reasons, for instance, the deficiency of incentive to conserve fish, which generates overcapacity problem in the fishery.[33]

Unlike excess capacity, overcapacity is a long-term phenomenon[34] or a persistent problem which, unless addressed, will undermine fisheries management objectives and result in an inefficient use of fisheries resources.[35] Generally, overcapacity exists when the allocation of inputs and outputs in the market is inefficiently done.

To reduce capacity in fisheries the distinction between excess capacity and overcapacity needs to be understood clearly. However, overcapacity and excess capacity are not always directly linked. Overcapacity may occur even there is no excess capacity.[36] There may also be a level of excess capacity that can persist with overcapacity.[37]

In the past, although resource managers have been worried about the optimum level of the use of capital stock or number of vessels, capacity has not really been reduced. However, along with the concerns of production costs, resource managers have desired to measure the capacity by considering the inputs, such as a number of fishing vessels, which are capable to catch the MSY. Therefore, to apply the input-based concept in terms of excess capacity, the capacity can be referred to as the difference between the observed number of fishing vessels catching a given output and the number of fishing vessels needed to catch the capacity output. In the case of overcapacity, capacity can be referred to as the difference between the number of fishing vessels catching the resources with desirable conditions of such resources and the number of fishing vessels needed to catch a desirable level of optimum catch, the MSY for instance. The assumption of full input utilisation is required for these concepts. In other words, these concepts apply when a vessel or a fleet is extremely utilised.[38]

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[33] John M Ward and Rebecca Metzner, 'Fish Harvesting Capacity, Excess Capacity, and Overcapacity: A Synthesis of Measurement Studies and Management Strategies' (FAO, 2002) <ftp://ftp.fao.org/docrep/fao/005/y8169e/y8169e00.pdf> 56.

[34] Pascoe et al, above n 5, 14; Pomeroy, above n 23.

[35] Ward et al, above n 7, 10; The Fisheries Secretariat, *Overcapacity* (17 June 2014) <http://www.fishsec.org/the-issue/management-failures/overcapacity/>.

[36] Ward et al, above n 7, 6.

[37] Pascoe et al, above n 5, 14.

[38] Ibid 15.

Although the occurrence of excess capacity and/or overcapacity may cause the significant loss of benefits or alternate chances and ineffective production of a community, eliminating excess capacity and/or overcapacity can also be expensive in terms of socio-economic aspect. In several fisheries, the impact of capacity reduction results in the decreased rate of employment in fisheries sector. For example, when fishing vessels are removed from a fishery, vessel crews are therefore unemployed and need to find alternative career. Effective capacity management requires not only the measures or indicators to assess excess capacity and/or overcapacity, but also the appropriate measurement used for policy guidance in order to achieve the target biomass stocks and output levels (e.g., MSY). Moreover, in order to implement any formal capacity reduction programs, an appropriate timeline for capacity reduction must also be developed.[39]

1.1.2 Overfishing and Overexploitation

A fisheries management term, which is often used in relation to overcapacity is overfishing. When a fishery develops substantially, the catch per unit of effort (CPUE) tends to decline as more fishers share the catch.[40] If there is excessive use of capital and labour in the fishery[41] without specific actions undertaken to prevent such situation, the fishery resources would be led to an overfished stage.[42] This has more impact on valuable species because the more valuable the fish are, the less costly it is to catch them.[43] In order to determine overfishing, however, information on stock size and recruitment rates are needed.[44] Simply put, overfishing exists when fishing operation decreases the fish resources to a level that is lower than the acceptable level. However, overfishing can take a number of forms. These forms include target overfishing,

[39] Ibid.

[40] Rosemary H Lowe-McConnell, *Ecological Studies in Tropical Fish Communities* (Cambridge University Press, 1987) 307.

[41] FAO, above n 2.

[42] Overfished valuable species are, for instance, the Atlantic bluefin tuna (*Thunnus thynnus*) in the Western Atlantic Ocean, see World Wildlife Fund, *Atlantic Bluefin Tuna Overview* http://www.worldwildlife.org/species/finder/tuna/atlantic-tuna-overview.html#; bigeye tuna (*Thunnus obesus*) in the Eastern Pacific Ocean, see World Wildlife Fund, *Bigeye Tuna Overview* <http://www.worldwildlife.org/species/finder/tuna/bigeye-overview.html>; narrow-barred Spanish mackerel (*Scomberomerus commerson*) in the Western Indian Ocean, see FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2010* (FAO, 2010) 42.

[43] Clark, above n 4, 8.

[44] Lowe-McConnell, above n 40, 307.

economic overfishing,[45] ecosystem overfishing, recruitment overfishing, and growth overfishing.[46] Growth overfishing, which has been focused the most in the tropical regions, refers to a condition when the fish stocks are harvested before they are able to achieve their growth capability. The low CPUE obtained in such condition would probably be undesirable based on the economic perspective, except the catch provides big value due to the high market price of fish.[47] However, it is critical to note that any type of overfishing is cognate to non-sustainable use of the resources[48] and ultimately leads to resource depletion.

Overexploitation exists when the fish resources are harvested at a rate that is greater than the maximum rate, which allows such resources to reproduce and maintain.[49] Overfishing is a significant factor of the occurrence of overexploitation. In the past decades, fisheries management has attempted to address the problems of overfishing and those concerning socio-economic issues in national and international fisheries, but it has been later recognised that these problems are rather a consequence of overcapacity, which is a more severe issue.[50] As overcapacity is an important cause of overfishing,[51] it follows that fisheries, which are overfished, practically have an overcapacity problem.

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[45] Andrew A Rosenberg, 'Precautionary Management Reference Points and Management Strategies' in FAO (ed), Precautionary Approach to Fisheries. Part 2: Scientific Papers. Prepared for the Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introductions). Lysekil, Sweden, 6–13 June 1995, FAO Fisheries Technical Paper 350/2 (FAO, 1996) 210, 130. Economic overfishing exists when the resources are not efficiently harvested. The economic overfishing is generally referred to the point at which fishing effort surpasses the total profit generated in the fishery, i.e., the value of fish production does not cover the fishing costs. See, Reef Resilience, Overfishing (2014) <http://www.reefresilience.org/fish-spawning-aggregations/whats-the-problem/overfishing/>.

[46] It has been found that growth overfishing, recruitment overfishing, and ecosystem overfishing (all are called biological overfishing) occur in Southeast Asian waters. See, Daniel Pauly, *Some Simple Methods for the Assessment of Tropical Fish Stocks* (FAO, 1983) 39-40.

[47] Alain Fonteneau, 'Biological Overview of Tunas Stocks and Overfishing' in Judith Swan and Dominique Greboval (eds), Report and Documentation of the International Workshop on the Implementation of International Fisheries Instruments and Factors of Unsustainability and Overexploitation in Fisheries, Mauritius, 3-7 February 2003 (FAO, 2004) 117.

[48] FAO, *Destructive Fishing Practices* <http://www.fao.org/fishery/topic/12353/en>.

[49] GIWA, Challenges to International Waters; Regional Assessments in a Global Perspective (United Nations Environment Programme, 2006).

[50] FAO, *Assessing Fishing Capacity and Overcapacity* FAO <http://www.fao.org/fishery/topic/14858/en>.

[51] Ibid.

1.1.3 Capacity Utilisation and Overcapitalisation

Capacity utilisation represents the level to which a vessel is fully utilised.[52] Alternatively, it is the total of inputs and productive capital used to generate a given output, corresponding the output level that can be generated if the capital stock and varieties of inputs are extremely used.[53] Based on an input based viewpoint, capacity utilisation may associate with the proportion of the number of actual operating days to the number of potential operating days under normal conditions, whereas capacity utilisation is the proportion of the fish production actually caught to the fish production potentially caught under full utilisation of vessels according to an output based viewpoint.[54]

Overcapitalisation in fisheries is more complex than that encountered in industrial organisations.[55] Overcapitalisation is a longer-term problem for the fisheries and contributes to overfishing as discussed above. Overcapitalisation refers to overinvestment in assets (capital).[56] Therefore, overcapitalisation is considered to exist if the fleet size or the number of vessels is larger than the level required for harvesting a specified yield that is possibly larger than the present yield.[57] If overinvestment of capital is occurred in the market, then such excessive use of capital and labour generates biological overfishing.[58]

1.2 Overcapacity Problem in Global Context

The main problem with regard to capacity in fisheries is overcapacity. In general, overcapacity causes not only the resource overexploitation but also the ineffective utilisation of resources, capital stock and other productive factors associated with the fishing operation. Overcapacity is, therefore, considered as an important factor of the overexploitation of global fisheries resources and creates a great loss in economic

[52] Ward et al, above n 7, 4.

[53] Pascoe et al, above n 5, 12.

[54] Ward et al, above n 7, 4.

[55] Greboval and Munro, above n 19, 2.

[56] FAO, above n 15.

[57] Ward et al, above n 7, 4-5.

[58] FAO, above n 15.

sector.[59] The overcapacity problem in fisheries and the reduction of capacity to a level commensurate with the sustainable exploitation of resources have been internationally focused for many decades.[60] Several States have developed and implemented the fishery policy to curb their fishing capacity and conserve fisheries resources.[61]

According to the latest data estimates in 2011,[62] 28.8 per cent of global marine resource stocks are overexploited; hence the resource yield is lower than the maximum potential level because of the excess fishing activities. Furthermore, 61.3 per cent of these stocks are extremely exploited and, thus, produce the catch, which is at or close to the level of MSY. Only 9.9 per cent of stocks are reasonably harvested or underexploited, which has some potential to increase production. These figures affirm that the ratio of the underexploited stocks has continuously reduced, from 40 per cent in 1974[63] to 23 per cent in 2005,[64] 20 per cent in 2007,[65] 15 per cent in 2008,[66] 12.7 per cent in 2009[67] and then 9.9 per cent in 2011.[68] This means non-fully exploited stocks have annually decreased about 0.8 per cent in average. On the contrary, the proportion of overexploited stocks has raised over time from 10 per cent in 1974[69] to 17 per cent in 2005,[70] 19 per cent in 2007,[71] 28 per cent in 2008,[72] 29.9 per cent in 2009,[73] and slightly

[59] Greboval and Munro, above n 19, 1.

[60] Fishing capacity management has been remarked as an urgent need under the March 1995 Rome Consensus on World Fisheries, the 1995 FAO Code of Conduct for Responsible Fisheries, and the 1995 Kyoto Declaration and Plan of Action. See, FAO, *Fishing Capacity* <http://www.fao.org/fishery/topic/2898/en>.

[61] FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2008* (FAO, 2009) 29.

[62] FAO Fisheries and Aquaculture Department, The State of World Fisheries and Aquaculture 2014: Opportunities and Challenges (FAO, 2014) 37.

[63] FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2006* (FAO, 2007) 29.

[64] Ibid.

[65] FAO Fisheries and Aquaculture Department, above n 61, 7.

[66] FAO Fisheries and Aquaculture Department, above n 42, 10.

[67] FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2012* (FAO, 2012) 11.

[68] FAO Fisheries and Aquaculture Department, above n 62.

[69] FAO Fisheries and Aquaculture Department, above n 67.

[70] FAO Fisheries and Aquaculture Department, above n 63, 29.

[71] FAO Fisheries and Aquaculture Department, above n 61, 7.

[72] FAO Fisheries and Aquaculture Department, above n 42, 10.

[73] FAO Fisheries and Aquaculture Department, above n 67, 11.

decreased to 28.8 per cent in 2011[74] or averagely increased about 0.5 per cent per year. Thus, effective rebuilding plans undoubtedly need to be put in place. Moreover, among the top ten species of the global stocks,[75] which, in terms of the amount, jointly contribute 24 per cent of the global production from marine capture fisheries, are extremely exploited, or overexploited.[76] The species fully exploited include the anchoveta stocks in the Southeast Pacific, Alaska pollock (*Theragra chalcogramma*) in the North Pacific, Atlantic cod (*Gadus morhua*) in the Northeast Atlantic, Atlantic herring (*Clupea harengus*) stocks in the Northeast and Northwest Atlantic, and chub mackerel (*Scomber japonicas*) stocks in the Eastern Pacific and the Northwest Pacific. Some stocks, such as Atlantic cod (*G. morhua*) in the Northwest Atlantic, are considered to be overexploited.[77] However, the production of such species could be increased if the restoring plans are implemented effectively. Overall, 90 per cent of the global fish stocks are found as fully or extremely exploited or overexploited and, therefore, both effective management and precautionary management are required.[78]

Apart from concerns about the exploitation level of stocks, concerns about fishing capacity have also centred on the negative impact of certain fishing gears and increasing the number of fishing vessels. Issues associating with the impact of fishing gears on the marine environment include: (i) the quantity of fuel or energy used for fishing the target species; (ii) the damages of marine environment; (iii) the loss of fishing capacity in terms of forsaken fishing gears called 'ghost fishing';[79] (iv) the amount and number of bycatch species; and (v) the amount of discarded aquatic animals (e.g., turtles,

[74] FAO Fisheries and Aquaculture Department, above n 62.

[75] They are, for example, anchoveta, Japanese anchovy (*Engraulis japonicus*), Alaska pollock (*Theragra chalcogramma*), Atlantic herring (*Clupea harengus*), Chilean jack mackerel (*Trachurus murphyi*), chub mackerel (*Scomber japonicus*), blue whiting (*Micromesistius poutassou*), and largehead hairtail (*Trichiurus lepturus*). See, FAO Fisheries and Aquaculture Department, above n 67, 53.

[76] FAO Fisheries and Aquaculture Department, above n 62, 38.

[77] Ibid.

[78] FAO Fisheries and Aquaculture Department, above n 42, 8.

[79] Ghost fishing is referred to the lost or abandoned fishing gears that continue to catch fish in the waters. It is harmful to environment and wastes the fish captured. Also, it is difficult to estimate the amount of fish caught. Generally, ghost fishing happens with passive fishing gears, including gill nets, traps, entangling nets, trammel nets. This issue was arisen for the first time at the 16th Session of the FAO Committee on Fisheries in April 1985. See, FAO, *Ghost Fishing* FAO <http://www.fao.org/fishery/topic/14798/en>.

seabirds[80]). These issues have been arisen in the commercial fishing gears, such as purse seines, trawl nets, dredges, traps, lift nets, gillnets, hooks and lines, and entangling net.[81]

In addition, the rapidly increasing number of fishing vessels is also a global concern. In 2012, the estimated number of total fishing vessels[82] in the world was 4.72 million. Among them, 3.23 million vessels that contributing 68 per cent of the world fleet are flagged in Asia. Sixty-eight per cent of the total number of vessels, or 3.2 million vessels, operates in marine waters;[83] 57 per cent of which have power engines. The vast majority of fishing vessels in the world are small-scale fishing vessels (less than 12 metres in length overall), contribute 79 per cent of the world total. Such vessels govern the regions in Africa, Latin America, the Near East and the Caribbean.[84] These small-fishing vessels are known to contribute to excess capacity, which not only increase global overfishing but also produce global fishing effort that costs almost double the value of the catch. Based on estimates produced more than a decade ago,[85] 25-53 per cent of global fishing capacity would need to be removed in order to achieve economic sustainability (25 per cent for incomes from fisheries to shoulder the costs of operation and 53 per cent for incomes to shoulder the total costs).

Concerns with regard to overcapacity or overcapitalisation occur in both EEZ and the high seas fisheries, particularly in shared stocks.[86] This is mainly due to the prevalence of open access conditions and inadequacy of strong regulatory frameworks.[87] The measures implemented to address the overcapacity problem in one country may be

[80] SEE Turtles, *Fisheries Bycatch* <http://www.seeturtles.org/fisheries-bycatch/>.

[81] FAO Fisheries and Aquaculture Department, above n 61, 68.

[82] Some data and information, which are reported to the FAO, are generally based on the national registers. Nonetheless, such registers usually do not include small fishing vessels, particularly the vessels operating in inland waters. Furthermore, such registers usually include non-operational fishing units. As a result, the existing information has limited usefulness for the purpose of monitoring the trends of global fishing capacity. Ibid 26.

[83] FAO Fisheries and Aquaculture Department, above n 62, 32.

[84] Ibid 33.

[85] Serge M Garcia and Christopher Newton, 'Current Situation, Trends and Prospects in World Capture Fisheries' in Ellen K Pitkitch, Daniel D Huppert and Michael P Sissenwine (eds), *Global Trends: Fisheries Management, American Fisheries Society Symposium* (American Fisheries Society, 1997) 3.

[86] FAO Fisheries and Aquaculture Department, above n 61, 26.

[87] Ward and Metzner, above n 33, 80.

weakened as another country that aims to fish the same fish stock may expand capacity in its area.[88]

Another threat to global fisheries related to overcapacity is illegal, unreported and unregulated fishing (IUU fishing).[89] IUU fishing that has greatly attracted global attention,[90] can take place in any capture fisheries within any national waters and on the high seas.[91] It is difficult for States and Regional Fisheries Management Organisations (RFMOs) to obtain the successful outcome of fisheries management when confronting with IUU fishing. IUU fishing can lead to not only short-term loss but also long-term loss in socioeconomic aspects, and create negative impacts on both environments and food security.[92] Moreover, IUU fishing may cause the depleted fishery, or substantially undermine the efforts to restore depleted stocks.[93] Apart from the target fish stocks, IUU fishing can create the negative impact on other species stocks and destroy the marine ecosystem. The large amount of by-catch, including fish juveniles and non-target species clearly shows the negative impact on marine resource conservation of IUU fishing.[94]

Overcapacity is a significant contributor of IUU fishing because overcapacity is a main cause of overfishing, which can easily lead to the problem of IUU fishing. Therefore,

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[88] FAO, above n 2.

[89] According to definitions given by FAO, **illegal fishing** refers to activities conducted by national or foreign vessels in State's water jurisdiction or RFMOs competent areas, without the permit or in contravention of the laws and regulations of the State or RFMOs. **Unreported fishing** refers to fishing activities that have not been reported, or have been misreported, to competent authority in contravention of national laws and regulations or to RFMOs in contravention of their reporting procedures. **Unregulated fishing** refers to fishing activities operated in competent areas of RFMOs by non-flagged vessels or are not a member of RFMOs in contravention of the conservation and management measures of RFMOs; or in areas or for fish stocks with a manner inconsistent with State responsibilities for marine resources conservation under international law. See, FAO, *International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing* (FAO, 2001) 2-3.

[90] Alex G O Elferink and Donald R Rothwell (eds), Oceans Management in the 21st Century: Institutional Frameworks and Responses (Martinuss Nijhoff, 2004).

[91] David J Doulman, Illegal, Unreported and Unregulated Fishing: Mandate for an International Plan of Action (FAO, 2000) vii.

[92] FAO, above n 89, 1.

[93] FAO, Implementation of the International Plan of Action to Deter, Prevent and Eliminate Illegal, Unreported and Unregulated Fishing (FAO, 2002) 1.

[94] Environmental Justice Foundation, *EJF Summary Conclusions on IUU Fishing* (March) <http://www.ejfoundation.org/pdf/hstf_submission.pdf>.

implementing appropriate management tools to control fishing capacity will technically prevent IUU fishing.[95]

At the regional level, Asia in particular, fishing capacity has increased in both large-scale and small-scale fisheries, while fisheries production has continued to decrease. Several factors have conduced to this problem, including the lack of fisheries management plans,[96] inadequate legislation, policies and operational measures. Ineffective systems of granting fishing gear and vessel licenses, inadequate catch and effort data collection, and the lack of efficient system of monitoring, control and surveillance (MCS) additionally diminish the success in addressing overcapacity in fisheries.[97]

Many attempts, both at national and international levels, have been made to tackle this overcapacity issue by implementing programs to reduce excess capacity, to eliminate negative incentives, such as fishing vessel subsidies aggravating the problems of overexploitation, and to promote positive incentives, such as the subsidies used to remove fishing vessels from the fishery.[98] However, it is likely that there are not many capacity reduction programs effectively implemented.[99]

1.3 Overcapacity Problem in Thailand

Overfishing has been recognised as a major concern in several areas of the East Asia region, including Thailand.[100] Overfishing generally occurs because of the excess fishing capacity of commercial fishing vessels purchased by investors in order to generate more income.[101] In Thailand, trawling, one of the main types of commercial

[95] FAO, above n 18, 10.

[96] Only 50 per cent of major fisheries have management plans. See, Gary Morgan, Derek Staples and Simon Funge-Smith, 'Fishing Capacity Management and IUU Fishing in Asia' (RAP Publication 2007/16, FAO/RAP, 2007) iii.

[97] Ibid.

[98] FAO Fisheries and Aquaculture Department, above n 61, 7.

[99] Ibid 140.

[100] Tegan C Hoffmann, Identifying Opportunities to Address Issues of Marine Fisheries and Biodiversity Conservation (MacArthur Foundation, 2010) 19.

[101] See, Peter Manning, *Control and Reduction of Fishing Capacity* <http://www.oceansatlas.com/world_fisheries_and_aquaculture/html/issues/govern/overcap/control.htm#topofdocument>.

fisheries has rapidly expanded since it was introduced in 1961.[102] Although the reduction of the size of trawl fleets has been observed for a decade,[103] the widespread damage to marine fish stocks in Thai waters has remained because of prolonged overfishing. The drastic reduction of time series CPUEs obtained by trawling surveys in the Gulf of Thailand is one of the clear evidence of overfishing. The CPUE has significantly decreased from 297.8 kg/hr[104] in 1961 to 63.12 kg/hr in 1972,[105] 22.37 kg/hr in 2003,[106] 19.78 kg/hr in 2007,[107] and then 18.23 kg/hr in 2012.[108] A similar trend has been found with the CPUE obtained from the Andaman Sea. For example, the demersal fish‘s catch rate obtained in 1966 was 238.9 kg/hr, and it substantially reduced to 105.3 kg/hr in 1971, 64.6 kg/hr in 1978, 37.5 kg/hr (in average) during the period of 1987-1988,[109] and then 23.28 kg/hr in 2010.[110]

Additionally, the results of MSY analysis of some dermersal species, such as big-eye, lizardfish, and threadfin bream, clearly show their overexploited status. To bring many of these stocks to recovery status would require a vast reduction of the existing fishing effort. For instance, in the Gulf of Thailand 40 per cent of current fishing effort used to harvest purple-spotted big-eye (*Priacanthus tayenus*) should be removed,[111] whereas 80 per cent of current fishing effort needs to be reduced for lizardfish (i.e., *Saurida*

[102] Klaus Tiews, 'The Development of Trawl Fisheries in Southeast Asian Countries as A Means of Increasing Marine Fisheries Production' 79.

[103] Department of Fisheries, Thai Fishing Vessels Statistics 2003-2009.

[104] kg/hr = kilogram/hour.

[105] Samran Ritraksa, 'Summary of the Study on Demersal Resources Status in the Gulf of Thailand by Using Otter Board Trawl Gear During 1963-1972' (Department of Fisheries, 1973) 6-14. The CPUE obtained in 1966 and 1969 was 130.77 and 102.74 kg/hr, respectively.

[106] Kanit Chuapun et al, 'Marine Resources in the Gulf of Thailand and Andaman Sea from Research Vessel during 2002-2005' (Department of Fisheries, 2008) 9-15.

[107] Marine Fisheries Research and Development Bureau, 'Annual Report 2008' (Department of Fisheries, 2009) 11-14.

[108] Marine Fisheries Research and Development Bureau, 'Annual Report 2012' (Department of Fisheries, 2012) <http://www.fisheries.go.th/marine/FormDownload/ANNUAL%20REPORT%202012.pdf> 28.

[109] Somsak Chullasorn, 'Status of Fishery Resources in the Andaman Sea Coast of Thailand' in Donna J Nickerson (ed), Community-based Fisheries Management in Phang-nga Bay, Thailand. Proceedings of the National Workshop on Community-based Fisheries Management Organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996, RAP Publication 1998/3, BOBP Report (FAO, 1998) vol 78, 72.

[110] Marine Fisheries Research and Development Bureau, 'Annual Report 2011' (Department of Fisheries, 2011) <http://www.fisheries.go.th/marine/FormDownload/ANNUALREPORT2011.pdf> 23.

[111] Amnuay Kongprom et al, Stock Assessment of Purple-Spotted Bigeye (Priacanthus tayenus Richardson, 1846) in the Gulf of Thailand (the Department of Fisheries, 2010) 23.

elongata and *S. undosquamis*).[112] Besides, the stocks of crustaceans (e.g., large-sized shrimps and oriental flathead lobsters), and cephalopods (e.g., squids and soft cuttlefish) have started to decline.[113] For example, the annual production of shrimps from marine capture fisheries has reduced from 119,000 tonnes in 1993 to 84,700 tonnes in 2003 and then 45,500 tonnes in 2012, whereas squids and soft cuttlefish have decreased from 188,200 tonnes from 1998 to 119,900 tonnes in 2012.[114] Overfishing has impacted on pelagic fish stocks too. The production of pelagic fisheries which started in 1973, has increased by fourfold just within two decades from 141,608 tonnes in 1973 to 614,814 tonnes in 1994.[115] Many of the pelagic species such as Indo-Pacific mackerel, sardine and anchovy, have been fully exploited, whereas round scad stocks are depleted.[116] To sum up, the overall marine resources in Thai waters, particularly the Gulf of Thailand, have been fully exploited or exploited beyond their natural capacity, and hence effective management measures will need to put in place.

Highly destructive fishing practices,[117] which include the utilisation of non-selective fishing gears (e.g., trawlers), highly efficient gears and fishing methods, as well as fishing with targeting the brood stocks during the spawning seasons, have been identified as the causes of the worsening marine resource status in Thai waters.[118] Management measures, e.g., quota systems, bans on destructive fishing activities, and marine protected areas, have unlikely been effective in developing States[119] including Thailand, due to various factors discussed in Chapters 4 and 5. Moreover, inadequate MCS due to limited human resource, financial and technical capability, increases the problem of IUU fishing, which is known to contribute to the overcapacity problem in Thai fisheries.

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[112] Piyachok Sinanun et al, Stock Assessment of Saurida elongata (Temminck & Schlegel, 1846) and S. undosquamis (Richardson, 1848) in the Gulf of Thailand (the Department of Fisheries, 2012) 30.

[113] Department of Fisheries, *The Master Plan on Marine Fisheries Management of Thailand* (Department of Fisheries, 2008).

[114] Department of Fisheries, *Fisheries Statistics of Thailand 2012,* Technical Paper No.9/2014 (2014) 16.

[115] Department of Fisheries, above n 113.

[116] Ibid.

[117] Destructive fishing gears and practices mean "the fishing gears and practices that have a destructive effect on ecosystems including environment, fishery resources, etc". See, SEAFDEC, *Responsible Fishing Operations,* Regional Guidelines for Responsible Fisheries in Southeast Asia (SEAFDEC, 2000) 10.

[118] Department of Fisheries, above n 113.

[119] GIWA, above n 49.

IUU fishing in Thailand is a significant threat owing to a growing level of marine resources exploitation and the inadequacy of effective management over fishing vessels.[120] IUU fishing, undertaken by large-scale and small-scale fishing vessels, is prevalent in both coastal areas and in the EEZ. In coastal areas, there is widespread law violation, particularly fishing in closed areas during closed seasons, using illegal mesh sizes of nets and destroying fish habitats (e.g., coral reefs, seagrass beds, mangroves) by some fishing practices (e.g., trawlers).[121] The most common illegal fishing practices in the marine capture fisheries include push netters and trawlers operating within fisheries reserve zones.[122] Lift-net vessels and purse seiners using lights to attract fish at night have also been found to be using small mesh size nets contrary to fisheries regulations.[123] However, to seize an illegal fishing vessel while committing an offense is difficult. The bulk of arrests are actually of smaller vessels as most of the larger and more powerful vessels are able to escape before a patrol vessel can reach them.[124] In addition, the patrol vessels focus their enforcement efforts in closed areas or during closed seasons of fishing due to limited capabilities.[125] Thus, a comprehensive record of illegal fishing incidents in Thai waters is difficult to obtain, and this can undermine enforcement against illegal fishing and hence inability to control fishing capacity in Thai fisheries.

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[120] IUU fishing existed in Thai fisheries has put Thailand at risk of fishing trade sanctions to EU markets. To address this issue, the Thai government has developed immediate action plans to improve the systems of fishing vessel registration and fishing license, and to install Vessel Monitoring System (VMS) on fishing vessels. See, Apinya Wipatayotin, 'Pitipong Sure EU Won't Apply Sanctions ', *Bangkok Post* (Bangkok), 15 January 2015 <http://www.bangkokpost.com/business/news/456873/pitipong-brushes-off-eu-trade-sanctions-threat-in-fisheries>; Prachachat Turakij, 'ฝืน IUU โทษสูงสุด 30 ล. พ.ร.บ.ประมงใหม่เข้มหนีใบแดงอียู [Violate IUU Has 30 Million THB of Maximum Fine Due to New Fisheries Act Aimed to Avoid EU's Santions]', *Prachachat Turakij* (Thailand), 19 January 2015 <http://www.prachachat.net/news_detail.php?newsid=1421653459>.

[121] Department of Fisheries, ผลคดีจับกุมผู้กระทำผิด พ.ร.บ. การประมง พ.ศ. 2490 ประจำเดือนพฤศจิกายน 2555 [Violations Against the Fisheries Act B.E. 2490 (1947) in November 2012] (17 December 2012) <http://www.fisheries.go.th/secretary/pr_old/news_detail.php?news_id=399>; Department of Fisheries, ผลคดีจับกุมผู้กระทำผิด พ.ร.บ. การประมง พ.ศ. 2490 และ พ.ร.บ.ว่าด้วยสิทธิการประมงในเขตการประมงไทย พ.ศ.2482 ประจำเดือนธันวาคม 2557 [Violations Against the Fisheries Act B.E. 2490 (1947) and the Act Governing the Right to Fish in Thai Waters B.E. 2482 (1939) in December 2014] (20 January 2015) <http://www.fisheries.go.th/secretary/index.php?option=com_content&view=article&id=17&news_id=566>.

[122] Sampan Panjarat, 'Sustainable Fisheries in the Andaman Sea Coast of Thailand' (Division of Ocean Affair and the Law of the Sea, Office of Legal Affairs, the United Nations, 2008) 44.

[123] Department of Fisheries, above n 121.

[124] David B Thomson, 'Post-Tsunami Rehabilitation of Small-scale Fisheries: Experiences from Thailand' (Paper presented at the Eighth Pacific Rim Fisheries Conference: Challenges Stewardship of Living Marine Resources in the Pacific Marine Ecosystem Hanoi, Vietnam, 22-24 March 2006).

[125] Department of Fisheries, above n 113.

There are also recorded incidents of Thai fishing vessels conducting illegal activities in areas under the jurisdiction of neighbouring States. This has created diplomatic tension between Thailand and those States, such as Indonesia.[126]

The lack of accurate fisheries data also contributes to the inability of Thailand to address problems of overcapacity. The complex characteristics of Thai fisheries make it difficult for the fisheries authority to obtain accurate data and timely information.[127] For example, small-scale fisheries in Thailand, by nature, are characterised by a great diversity of fishing methods, species caught and seasonal variability, as well as generally being carried out in a large number of dispersed villages,[128] making it hard to collect comprehensive data from each type of fishing gears. In addition, data analysis is a significant problem for small-scale fisheries.[129] Original methods of stock assessment largely rely on the analysis of single-species fisheries in relatively uniform environmental conditions, which cannot be applied easily to small-scale fisheries based on large number of species and environmental instability.[130] Non-powered and vessels less than six Gross Tonnage (GT) are also not legally required to be registered in Thailand, hence very little data is collected on the number and activities of such vessels.[131]

1.4 Objectives of the Thesis

This research will examine how Thailand implements international and regional legal, policy and technical measures to manage fishing capacity. It further aims to evaluate options and provide recommendations for Thailand to effectively manage fishing capacity in order to promote sustainable fisheries.

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[126] The issue of bilateral fisheries agreement between Thailand and Indonesia will be described under "Thai Marine Capture Fisheries beyond National Jurisdiction" section of Chapter 2.

[127] Department of Fisheries, above n 113.

[128] Ibid.

[129] It is because sampling and data collection used for collecting information on large-scale fisheries are not practical for small-scale fisheries because of the widespread location of fishing villages. See, Derek J Staples, Benedict Satia and Peter R Gardiner, *A Research Agenda for Small-scale Fisheries,* RAP Publication 2004/21 and FIPL/C 10009 (En) (FAO Regional Office for Asia and the Pacific, Bangkok, Thailand, 2004) 16.

[130] Robin L Welcomme and John A Gulland, 'Methods for Assessing the Resources Available to Small-scale Fisheries' (Paper presented at the The Nineteenth Fisheries Symposium Kyoto, Japan, 21-30 May 1980) 989.

[131] The process for the registration and concerned legislation will be discussed in Chapter 2.

1.5 Research Questions

This thesis will address three key research questions:

1. What are the standards and measures for fishing capacity management in the global and regional context?
2. What are the gaps and challenges in the management of fishing capacity in Thailand vis-à-vis global and regional standards and measures?
3. What are the options and recommendations for Thailand to promote effective fishing capacity management?

1.6 Research Hypothesis

The hypothesis of this study is that: “The current measures adopted by Thailand for fishing capacity management are inadequate and that there are gaps in the effective management of fishing capacity in Thailand.”

1.7 Scope and Limitation of the Thesis

This research will focus on fishing capacity in marine capture fisheries within the Thai EEZ, as well as Thai flagged vessels fishing in the national jurisdiction of other States and on the high seas. Inland or freshwater fisheries and aquaculture sectors are not within the scope of this study. The thesis will also examine Thailand’s national legislative framework and regulations, as well as relevant international and regional instruments, which are relevant and applicable to fishing capacity management.

1.8 Analytical Framework

In order to accomplish the objectives of this thesis, research into the relevant issues and the governing international and domestic framework on fishing capacity has been conducted. A set of criteria for fishing capacity management is developed based on relevant international and regional instruments, as well as significant technical measures. These criteria form the basis for assessing the measures implemented in Thailand on fishing capacity.

1.8.1 Desktop Research

Existing literature from both primary and secondary sources regarding marine capture fisheries in Thailand, and more specifically on fishing capacity, which include government reports, official statistics, and national policies, laws, regulations are analysed. For the international framework, relevant global instruments, FAO guidelines, regional policies, and research studies and reports have been critically examined in order to develop an analytical framework on managing fishing capacity based on international standards.[132]

1.8.2 Criteria to Determine the Adequacy of the Legal and Policy Framework to Manage Fishing Capacity

A set of criteria, which will be used to test the adequacy of the Thai fisheries framework, is developed based on relevant international and regional instruments analysed in Chapter 3. In summary the international instruments include the *1982 United Nations Convention on the Law of the Sea* (*LOSC*), the *1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas* (*FAO Compliance Agreement*), the *1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (*UN Fish Stocks Agreement*), the *1995 Code of Conduct for Responsible Fisheries* (*CCRF*), the *International Plans of Action for the Management of Fishing Capacity* (*IPOA-Capacity*), and the *WTO Agreement on Subsidies and Countervailing Measures*. At the regional level, the *Regional Plan of Action to Promote Responsible Fishing Practices* (including Combating IUU Fishing), SEAFDEC *Regional Code of Conduct for Responsible Fisheries*, and *Conservation and Management Measures of the Indian Ocean Tuna Commission* are analysed.

A set of criteria for fishing capacity management based on the aforesaid instruments are summarised to determine how to measure and assess fishing capacity (details discussed

[132] Such data and information used in this thesis is current as of 31 March 2015.

in Chapter 2); what the standards are for keeping the level of fishing capacity at a balanced level with the sustainable exploitation of fishery resources within the EEZ and beyond EEZ; and what the obligations are of States and measures that need to be undertaken to manage fishing capacity and prevent overcapacity within the national EEZ and on the high seas, including in areas managed by RFMOs. Details of the discussion responding to these questions are presented in Chapter 3. Subsequently, the management instruments to be applied when fishing capacity has exceeded sustainable levels are identified. These instruments, by considering how they change the incentives of fishers, are widely divided into two main groups, i.e., incentive blocking measures and incentive adjusting measures. Incentive blocking measures, which aim to restrict the fishing activities, are discussed in details in Chapter 4, whereas incentive adjusting measures, attempting to tackle the issue of property rights in fisheries and let the market to involve in fishing capacity reduction, are greatly discussed in Chapter 5. Additionally, supplementary measures that can indirectly control fishing capacity are analysed in Chapter 6.

1.9 Thesis Structure

This introductory chapter examines some of the key concepts related to fishing capacity, including excess capacity, overcapacity, overfishing, overexploitation, capacity utilisation, and overcapitalisation. It also discusses the overcapacity problem in global fisheries and focuses on the nature of this problem in Thailand's marine capture fisheries, and affirms the need for Thailand to effectively manage its fishing capacity. This chapter sets the scene for a more thorough examination of the extent of the problem of overcapacity in Thailand's fisheries and the various measures available under international and regional instruments to address the problem. In succeeding chapters, a fisheries profile of Thailand is presented; the international legal and policy framework, as well as management tools for fishing capacity management are critically analysed; and the specific measures implemented to manage fishing capacity in Thailand are examined.

Chapter 2 discusses the profile of marine capture fisheries in Thailand, which includes fisheries in Thailand's EEZ and fishing operation of Thai-flagged vessels beyond national jurisdiction. The profile categorises small-scale and large-scale fisheries in

terms of catch production, production value and number of fishing vessels. The chapter also discusses the legal and institutional framework with regard to the registration of fishing vessels and licensing of fishing gears. Chapter 3 analyses the international and regional instruments that are relevant to fishing capacity management, and subsequently develops a set of criteria based on the analysis. The criteria, together with the analysis in succeeding chapters concerning technical measures for fishing capacity controls, are later used to assess Thailand's legal and policy framework on fishing capacity.

Chapters 4, 5 and 6 examine management measures which are widely used to control fishing capacity, as well as the implementation of such measures by Thailand. Chapter 4 focuses on incentive blocking measures, i.e., input regulations (e.g., limited licensing, individual effort quota, gear and vessel restriction), and output regulations (e.g., vessel catch limits). The chapter also presents examples of quantitative and qualitative methods to measure fishing capacity. Chapter 5, discusses in detail incentive adjusting measures which are often used to manage fishing capacity including individual harvest quotas, territorial use rights, co-management and community-based fisheries management, taxes, and subsidies, whereas supplementary management measures such as ecosystem approach and multispecies fisheries management, closed seasons and closed areas, that can be applied to control fishing capacity are provided in Chapter 6.

Chapter 7 analyses the adequacy of the legal and policy framework in managing fishing capacity of Thailand by testing this existing framework against the criteria developed in Chapter 3. This chapter further identifies gaps and challenges confronted by Thailand in managing its fishing capacity. This chapter examines options and recommendations for Thailand to manage fishing capacity more effectively in order to ensure sustainable fisheries within and beyond its EEZ. These options and recommendations comprise legal, policy, institutional, and management considerations.

The synthesis of the results of each chapter is provided in Chapter 8. Based on the synthesis, it can be concluded that the legal, policy and institutional framework of Thailand is inadequate to effectively manage fishing capacity. Furthermore, management measures implemented by Thailand are also insufficient. The chapter suggests that Thailand should seriously take options and recommendations provided by this thesis into account in order to achieve the effective management of fishing capacity.

1.10 Research Significance

Thailand has been confronted with problems of overcapacity in fisheries for decades, and such problems have been getting worse because of the inadequacy of the management, legal and policy framework on fishing capacity in the country. The significance of this thesis lies in its academic and practical application. First, by examining the international and regional criteria on fishing capacity, this thesis provides a comprehensive understanding of measures to address overcapacity which integrates not only the measures provided in the IPOA-Capacity but also those developed under other instruments. These criteria can form the basis of assessing domestic and regional framework on fishing capacity not only in Thailand but also in other countries.

This thesis also makes a substantial academic contribution to this discipline and existing literature, particularly on fishing capacity management in Thailand and in the greater Southeast Asia, which is scant and out-of-date.

CHAPTER 2 CONTEXT SETTING OF THAI MARINE FISHERIES

2.1 Introduction

The purpose of this Chapter is to present the general profile of Thailand's fisheries, with a view to demonstrating the overcapacity in its fishery. The chapter has five main sections. The first section presents the general profile of marine capture fisheries of Thailand within Thai waters and beyond national jurisdiction. The second section analyses the current state of marine capture fisheries in terms of volume and value of production, and characteristics of small-scale and large-scale fishing vessels, whereas the third section examines the exploitation rate of marine capture fisheries in Thailand. The fourth section analyses the process of registration of fishing vessels and licensing of fishing gears in Thailand, which are a basic element of fishing capacity controls. Lastly, the chapter discusses the Master Plan for Marine Fisheries of Thailand, which has been implemented to regulate marine fisheries in country.

2.2 Profile of Marine Capture Fisheries of Thailand

Thailand is located in the Southeast Asian Peninsula. It is surrounded by Laos in the north and northeast, Myanmar in the north and west, Cambodia in the east and Malaysia in the south. Thailand covers the area of 513,155 square kilometres.[1] It is located between 5^{o} and 20^{o} North latitude, and between 97^{o} and 106^{o} East longitude (Figure 2.1).

[1] Panu Tavarutmaneekul et al, *Fisheries in Thailand,* Extension Paper vol. 27 (National Inland Fisheries Institute, Department of fisheries, 1996).

Figure 2.1: Thailand and Thai Waters

Source: United Nations, Map No. 3853 Rev. 2 (July 2009) Department of Field Support, Cartographic Section http://www.un.org/Depts/Cartographic/map/profile/thailand.pdf.

Thailand has 2,614.40 kilometres of coastline in the Gulf of Thailand (1,874.80 kilometres) and the Andaman Sea (739.60 kilometres).[2] There are 23 coastal provinces located along these two fishing areas, i.e., 17 provinces along the Gulf of Thailand and six provinces along the Andaman Sea.[3] The total area of the Thai Exclusive Economic Zone (EEZ) is approximately 420,280 square kilometres, which is composed 304,000

[2] Department of Fisheries, *The Marine Fisheries Statistics 2008 Based on the Sample Survey* Technical Paper No.18/2010 (2010) 154.

[3] Peter Flewwelling and Gilles Hosch, 'Country Review: Thailand (Andaman Sea)' in Cassandra De Young (ed), *Review of the State of World Marine Capture Fisheries Management: Indian Ocean*, FAO Fisheries Technical Paper (FAO, 2006) vol 488, 175.

square kilometres of the Gulf of Thailand (86 metres of maximum depth and 45 metres of average depth) and 116,280 square kilometres of the Andaman Sea (3,777 metres of maximum depth and 870 metres of average depth[4]).[5] As of 31 December 2013, the population of Thailand is about 64.8 million.[6]

The bottom floor of the Gulf of Thailand is covered by sands and mud.[7] It is recognised as a Large Marine Ecosystem (LME)[8] Class I[9] with unique oceanographic, biological, and ecological characteristics. Due to the shallow depths, and the inrush of several rivers,[10] the Gulf of Thailand is, therefore, considered a highly productive water body in terms of marine fisheries and other aquatic resources.

The Gulf of Thailand is biologically rich in both diversity and abundance[11] due to the favourable environmental conditions. The important components of this ecosystem are mangrove forests, sea grass beds, coral reefs and fishery resources.[12] In terms of fishery

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[4] *Andaman Sea* <http://www.allthesea.com/Andaman-Sea.html>.

[5] Bay of Bangal Programme, 'Report of the Regional Workshop on the Precautionary Approach to Fishery Management' (Paper presented at the Regional Workshop on the Precautionary Approach to Fishery Management, Medan, Indonesia, 25-28 February 1997) <ftp://ftp.fao.org/docrep/fao/007/ad914e/AD914E00.pdf>.

[6] They are composed 31,845,971 of men and 32,939,938 of women. See, Department of Provincial Administration, *Notification of General Register Office: Number of Population in Thailand by Provinces based on Civil Registration* <http://stat.bora.dopa.go.th/stat/y_stat56.html>.

[7] Flewwelling and Hosch, above n 3.

[8] LMEs refer to regions of ocean and coastal area that contain river basins and estuaries and extend out to the sea, and have bound of continental shelves and the seaward margins of the systems of coastal current. LMEs are quite large in area and have been drawn based on their physical and biological characteristics, including *inter alia*: bathymetry, productivity, hydrography, and trophically populations.

See, United Nations Atlas of the Oceans, *Large Marine Ecosystems (LMEs)* <http://www.oceansatlas.org/servlet/CDSServlet?status=ND0xMjcyNyZjdG5faW5mb192aWV3X3NpemU9Y3RuX2luZm9fdmlld19mdWxsJjY9ZW4mMzM9KiYzNz1rb3M~>.

[9] The Gulf of Thailand is considered a LME Class I, highly productive ecosystem (>300 $gCm^{-2}yr^{-1}$). See, Kenneth Sherman and Gotthilf Hempel (eds), *The UNEP Large Marine Ecosystems Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas*, UNEP Regional Seas Report and Studies No.182 (2009) 255.

[10] Many rivers in addition to the Chao Phraya river go to the Gulf of Thailand near its head, including Tha Chin, Mae Klong, and Bang Pakong rivers, whereas several rivers go along the coast. See, Zafar Adeel et al, 'Capacity Development Needs in the Chao Phraya River Basin and the Gulf of Thailand' (Paper presented at the Managing Shared Waters (MSW) Conference, Hamilton, Ontario, Canada, 23-28 June 2002) <http://www.pollutionprobe.org/managing.shared.waters/chaophraya.pdf>.

[11] World Wildlife Fund, *Andaman Sea Ecoregion* <http://assets.panda.org/downloads/andamancoral.pdf>.

[12] Kungwan Juntarashote, *Summary Report Management of the Andaman Sea Large Marine Ecosystem* FAO <http://www.fao.org/fi/oldsite/BOBLME/website/sum_rep/THAILAND_SUMMARY.pdf>.

resources, there are more than 160 groups of species significantly found in catch composition obtained from marine resource surveys in the Gulf of Thailand.[13]

The Andaman Sea, on the other hand, has a narrow continental shelf shelving deeper offshore.[14] It is the southeastern part of the Bay of Bengal,[15] which is situated in monsoon zone and receives substantial amounts of rainfall.[16] It is considered an LME as well.[17] The Andaman Sea also has a great marine biodiversity with more than 140 groups of species significantly obtained in catch composition of marine resource surveys.[18]

Based on the conditions mentioned above, these two areas of waters are considered important fishing grounds for Thai fisheries. Both small-scale and large-scale fisheries are widely conducted in the Gulf of Thailand and the Andaman Sea.

Fisheries have played a very important supporting role in Thailand as can be seen from the increased contribution of product values from the fisheries sector to Gross Domestic Product (GDP) of Thailand. The values from fisheries have increased from THB67,410 million (USD2,107 million)[19] in 1993 to a peak of THB117,796 million (USD3,681 million) in 2000 and decreased to the lowest level within 10 years of the value THB94,033 million (USD2,939 million) in 2008.[20] Later, fisheries product values continuously increased to the highest level of THB129,666 million (USD4,052 million) in 2014[21] with the equivalence of 1.1 per cent of Thailand's GDP[22] (Figure 2.2).

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[13] The surveys are annually conducted by research survey vessels (using otter board trawl gear) of the Department of Fisheries, Thailand. See, Kanit Chuapun et al, 'Marine Resources in the Gulf of Thailand and Andaman Sea from Research Vessel during 2002-2005' (Department of Fisheries, 2008) 9-15.

[14] Flewwelling and Hosch, above n 3.

[15] International Hydrographic Organisation, 'Limits of Oceans and Seas' (1953) <http://www.iho-ohi.net/iho_pubs/standard/S-23/S23_1953.pdf> 22.

[16] Mark McGinley, *Bay of Bengal Large Marine Ecosystem* (29 August 2008) <http://www.eoearth.org/article/Bay_of_Bengal_large_marine_ecosystem>.

[17] Ibid.

[18] Chuapun et al, above n 13, 32-37.

[19] At THB32 = USD1 as of 2014. The succeeding conversions are based on 2014 exchange rates, rounded off to the nearest baht and dollar.

[20] Office of the National Economic and Social Development Board, *Gross Domestic Product: Q4/2014 Report* (16 February 2015) Office of the National Economic and Social Development Board <http://eng.nesdb.go.th/Default.aspx?tabid=481>.

[21] Ibid.

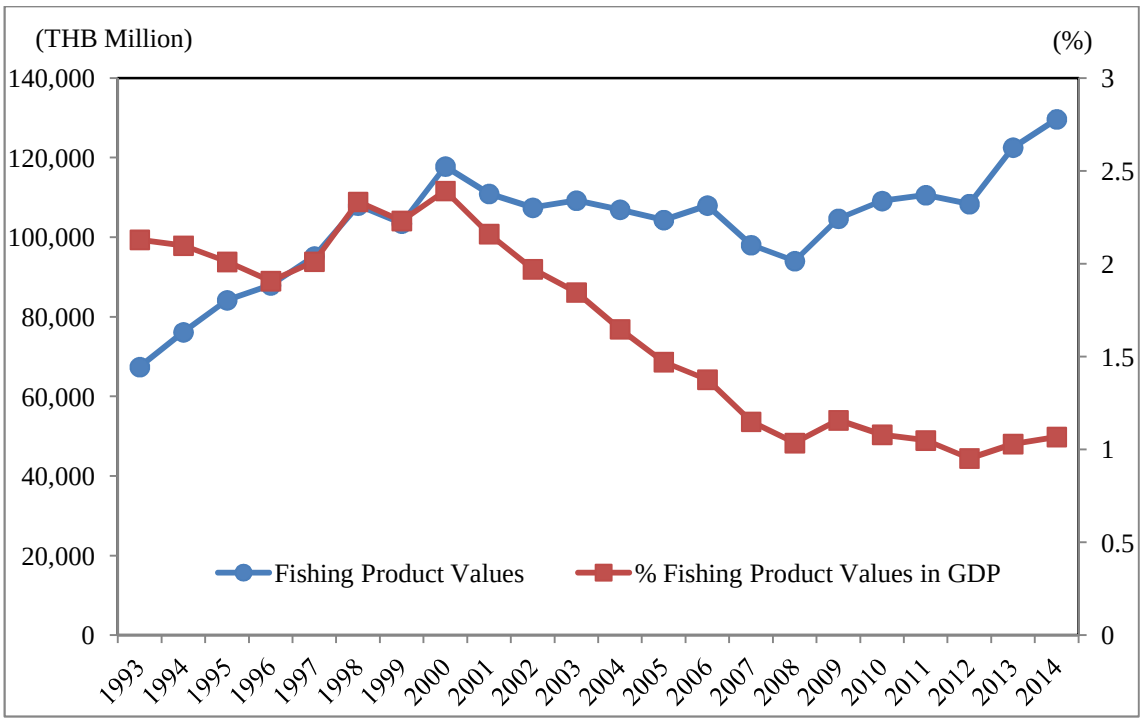

Figure 2.2: National product values (at current market prices) coming from the fisheries sector in Thailand

Source of data: Office of the National Economic and Social Development Board, Gross Domestic Product: Q4/2014 Report (16 February 2015) Office of the National Economic and Social Development Board http://eng.nesdb.go.th/Default.aspx?tabid=481.

Additionally, exported products from the fisheries sector bring in substantial income to Thailand. In term of values, fisheries products, particular canned seafood products, have always been in the top 10 of exported products of Thailand, and tend to increase continuously.[23] The value of canned seafood products significantly increased from THB71,408 million (USD2,232 million) in 2003 to THB99,053 million (USD3,095 million) in 2006, THB125,054 million (USD3,908 million) in 2008, and to THB158,867 million (USD4,965 million) in 2012, which represents 2.24 per cent of total values of exported products from Thailand (Table 2.1). However, it is essential to note that the raw products used in the canned seafood industry in Thailand are partly from imported fish, which are harvested by Thai fishing fleets and other States' fisheries.[24]

[22] In 2014, the GDP of Thailand was THB12,141.1 Billion (USD379.4 Billion), whereas GDP per capita was THB176,958 (USD5,530). See, ibid.

[23] The Customs Department of Thailand, 'Customs Report during 2004 to 2012' (2005-2013).

[24] Thai Tuna Industry Association, *Statistics 2012-2014* (18 July 2014) <http://www.thaituna.org/download/Thai_Import_and_Export_Statics_of_Tuna_Products_in_2012-2014.pdf>.

Table 2.1: The value obtained from canned seafood products exported from Thailand

Year	Values of Canned Seafood Products (THB million)	Total Values of Exported Products (THB million)
2003	71,408	3,326,014
2004	76,858	3,922,410
2005	99,669	4,436,677
2006	99,053	4,938,508
2007	106,707	5,254,998
2008	125,054	5,853,627
2009	121,484	5,197,121
2010	123,035	6,176,424
2011	145,150	6,910,272
2012	158,867	7,091,644

Source of data: The Customs Department of Thailand, 'Customs Report during 2004 to 2012' (2005-2013).

With respect to employment in fisheries, based on the 2000 marine fisheries census survey, approximately 58,000 families engaged either in fulltime fishing or fishing supplemented with aquaculture.[25] The number of fishing households increased by 8.8 per cent in 2000 compared with the 1995 marine fisheries census.[26] The great majority (82.2 per cent) of fishers was male. However, a remarkable drop in the number of young fisher group (20-30 years) from 32.5 per cent to 24.3 per cent compared to the 1995 census shows less interest in fishing among the young generations, as fishing is considered as a hard job with low income.[27]

2.2.1 Marine Capture Fisheries in Thai Waters

Marine capture fisheries are defined as all types of capturing of natural living resources in the marine environment.[28] Since 1945, marine capture fisheries have significantly

[25] National Statistical Office, *The 2000 Intercensal Survey of Marine Fishery* (Statistical Data Bank and Information Dissemination Division, National Statistical Office, 2001).

[26] National Statistical Office, *1995 Marine Fishery Census of Thailand* (Statistical Data Bank and Information Dissemination Division, National Statistical Office, 1997).

[27] National Statistical Office, above n 25.

[28] David Lymer et al, *A Review and Synthesis of Capture Fisheries Data in Thailand: Large versus Small-scale Fisheries*, RAP Publication 2008/17 (2008) 33.

developed and rapidly expanded in several developing countries of the South China Sea region, including Thailand.[29] Such development is contributed by a number of factors including: (i) the introduction of modern fishing technologies and techniques, e.g., using gill nets made by monofilament nylon in small-scale fisheries, and using trawl nets in large-scale fisheries; (ii) increasing the motorisation of fisheries vessels; (iii) technical assistance provided by international agencies, e.g., FAO, and other donors; (iv) capital investment supported for establishing necessary infrastructure; (v) the successful exploration of new fishing areas in deep sea waters; and (vi) the governments' recognition of the importance of the fisheries sector in their economies, resulting in the strengthening the fisheries sector.[30]

The fisheries development of Thailand has been accelerated by the world market. This has been reflected in the speedy development of trawl fisheries in the 1970s, aiming to catch shrimps for exporting, and also by the relatively fast development of purse seine fisheries in the early 1980s, aiming for pelagic species.[31] This resulted in the dramatic increase in the total annual production from marine capture fisheries of Thailand from about 200,000 tonnes before 1960 to about two million tonnes in 1977[32] and reaching a peak of 2.83 million tonnes in 1995.[33] The production of marine capture fisheries stabilised at the level above two million tonnes for about a decade until it significantly dropped to 1.64 million tonnes in 2008.[34] Such big reduction was due to not only the problems of resources overexploitation and economic crisis,[35] but also the exclusion of some landing production obtained by Thai fishing vessels, which operated in Indonesian waters under the new fishing arrangements and were required to fly the Indonesian

[29] Ibid 20.

[30] Deb Menasveta, 'Fisheries Management in the Exclusive Economic Zones of Southeast Asia before and after Rio and the Prospects for Regional Cooperation' in Kheng Lian Koh, Robert C Beckman and Chia Lin Sien (eds), *Sustainable Development of Coastal and Ocean Areas in Southeast Asia: Post-Rio Perspectives* (National University of Singapore, 1995) 98.

[31] Lymer et al, above n 28, 1.

[32] Kachornsak Wetchagarun, 'A Small-scale Fisheries Pilot Project in Thailand' (Paper presented at the The Nineteenth Fisheries Symposium Kyoto, Japan, 21-30 May 1980) 659.

[33] Department of Fisheries, *Fisheries Statistics of Thailand 2004*, Technical Paper No.4/2006 (2006) 13.

[34] Department of Fisheries, *Fisheries Statistics of Thailand 2008*, Technical Paper No.12/2010 (2010) 13. The fisheries statistics of Thailand are analysed and published by Fishery Statistics Analysis and Research Group under Information Technology Center of the Department of Fisheries.

[35] Office of Agricultural Economics, *The Agricultural Economics in 2008 and Outlook for 2009* (2008).

flag.[36] The production of marine capture fisheries slightly increased again to 1.66 million tonnes in 2009,[37] and then continuously decreased to 1.5 million tonnes in 2012 with 87.2 per cent coming from Thai waters (73 per cent from the Gulf of Thailand and 27 per cent from the Andaman Sea) and the remaining 12.8 per cent coming from adjacent seas.[38]

With such prolonged high levels of production, marine capture fisheries have then been the biggest contributor to the fisheries production of Thailand in the past two decades (Figure 2.3). Throughout the period between 1985 to 2012, marine capture production represents more than 50 per cent of total fisheries production of Thailand with the maximum of 91.4 per cent in 1987 (Figure 2.4). However, due to its rapid development, the production from coastal aquaculture sector has increased progressively, shrimp culture in particular.[39]

[36] In 2008, Indonesia issued a new fisheries policy that allowed Thai fishing vessels to operate in Indonesian waters only under Integrated Capture Fisheries Scheme that requiring Thai fishing vessels to change to Indonesian vessels. See, Marine Fisheries Research and Development Bureau, 'Annual Report 2011' (Department of Fisheries, 2011) <http://www.fisheries.go.th/marine/FormDownload/ANNUALREPORT2011.pdf> 31.

[37] Department of Fisheries, *Fisheries Statistics of Thailand 2009*, Technical Paper No.9/2011 (2011) 13.

[38] Department of Fisheries, *The Marine Fisheries Statistics 2012 Based on the Sample Survey* Technical Paper No.14/2014 (2014).

[39] In 2012 shrimp culture contributed 74.6 per cent of total aquaculture production of Thailand. 96.5 per cent of shrimp culture was the culture of Vannamei shrimp (*Penaeus vannamei*). See, Department of Fisheries, *Fisheries Statistics of Thailand 2012*, Technical Paper No.9/2014 (Department of Fisheries, 2014) 18, 39.

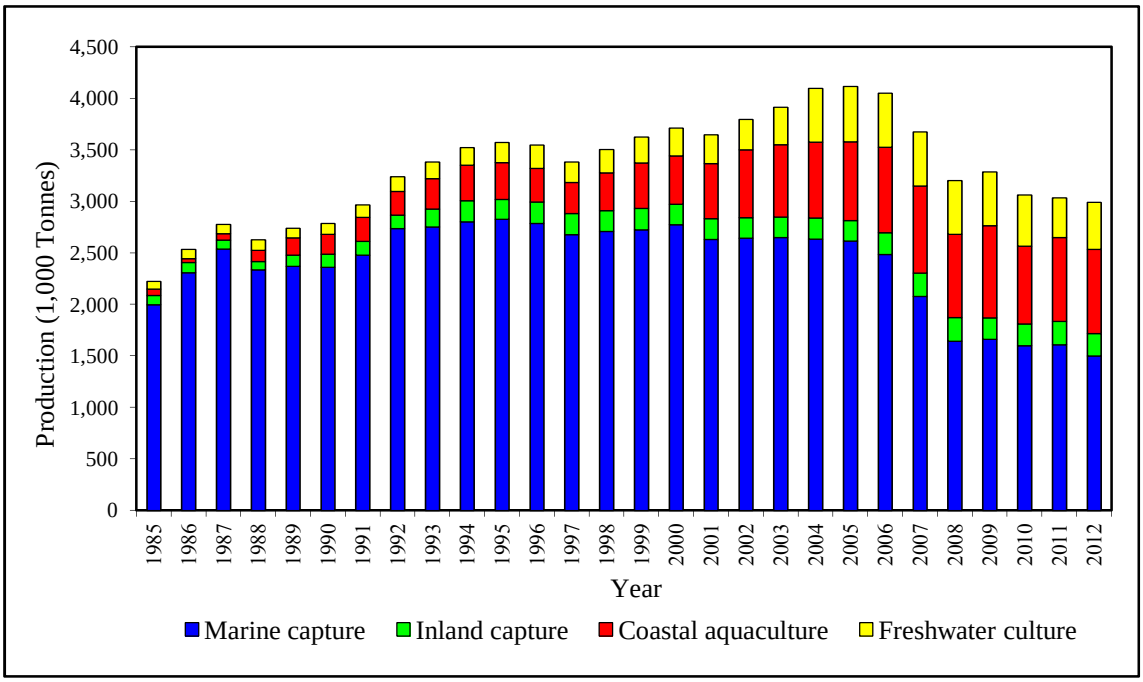

Figure 2.3: Fisheries production in quantity by sub-sectors during 1985 to 2012

Source of data: Department of Fisheries, *Fisheries Statistics of Thailand 2004*, Technical Paper No.4/2006 (2006) 13; Department of Fisheries, *Fisheries Statistics of Thailand 2012*, Technical Paper No.9/2014 (2014) 13.

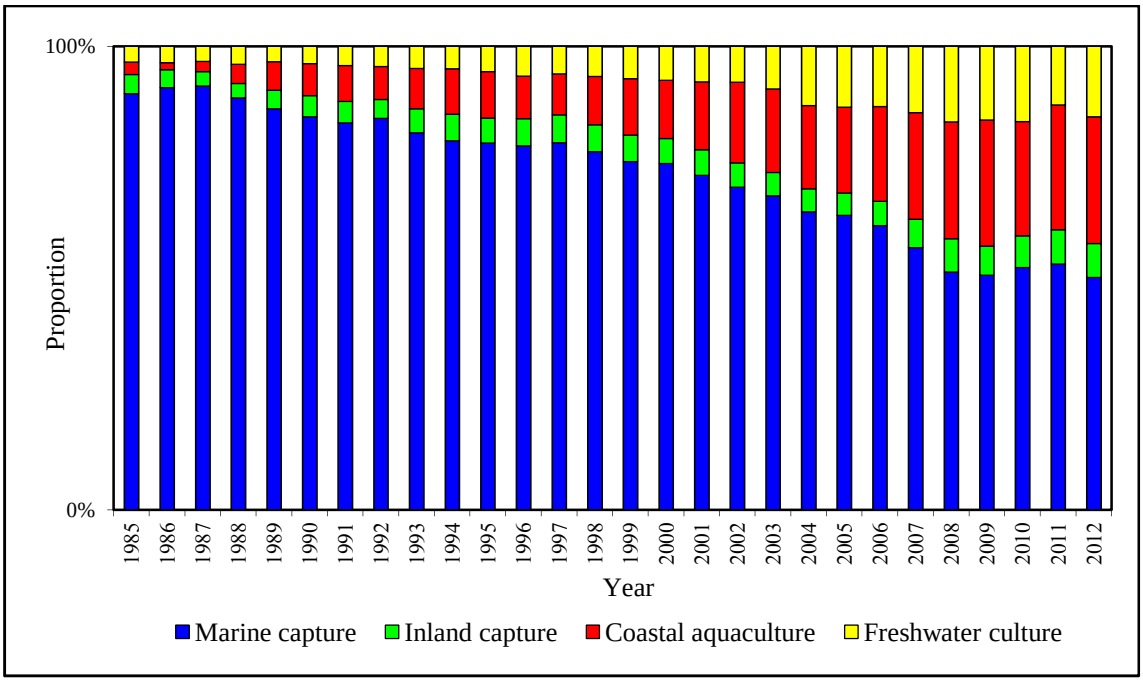

Figure 2.4: Proportion of fisheries production by sub-sectors during 1985 to 2012

Source of data: Department of Fisheries, *Fisheries Statistics of Thailand 2004*, Technical Paper No.4/2006 (2006) 13; Department of Fisheries, *Fisheries Statistics of Thailand 2012*, Technical paper No.9/2014 (2014) 13.

In terms of production value, the value of marine capture fisheries production has also increased relatively from THB14,077.3 million (USD439.9 million) in 1985 to THB64,169.5 million in 2003 (USD2,005.3 million), and substantially decreased to THB42,147 million (USD1,317.1 million) in 2008 (Figure 2.5), which reflected the significant decrease in marine capture fisheries recorded in 2008. However, although the production from marine capture fisheries contributes the majority of fisheries production in Thailand, its value, on the other hand, on the average contributes only half of the total value obtained from fisheries production (Figure 2.6). It is because the price per unit of fisheries production from coastal aquaculture, particularly shrimp culture, is generally higher than the price per unit of fisheries production from marine capture fisheries and other fisheries sectors. For example, the price of Vannamei shrimp from aquaculture is THB123.7 (USD3.9) per kilogram on average,[40] whereas the price of economic fish species from marine capture fisheries is mostly less than THB50 (USD1.6) per kilogram.[41] This makes the value from coastal aquaculture production to substantially contribute to the overall value.

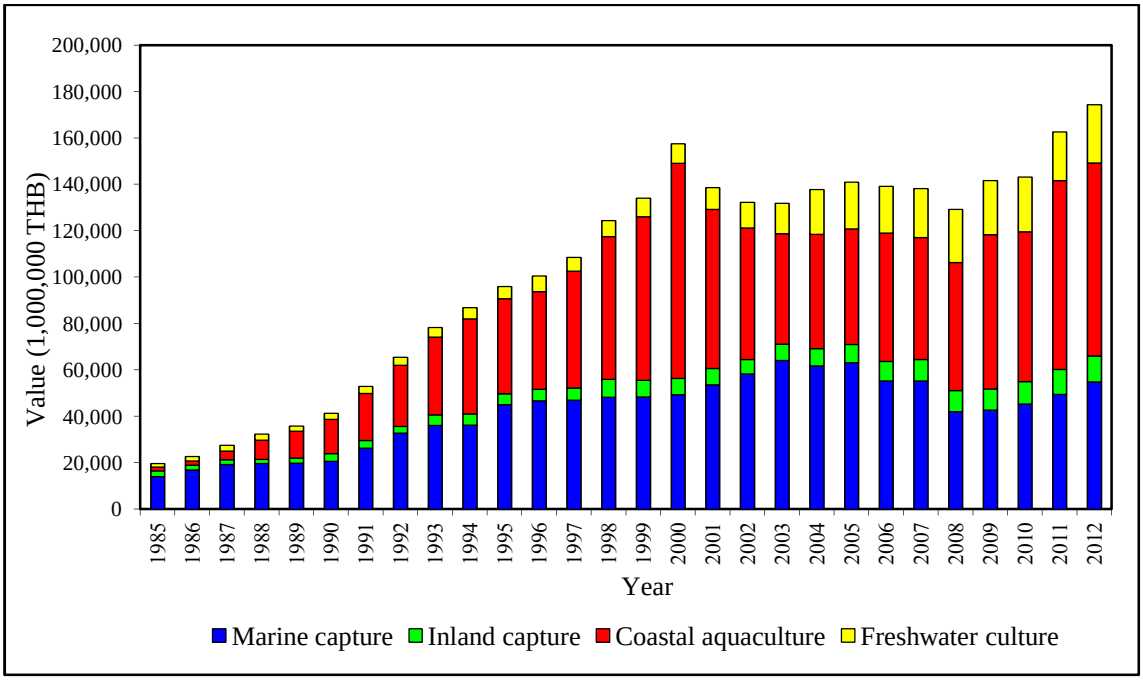

Figure 2.5: Value of fisheries production by sub-sectors during 1985 to 2012

Source of data: Department of Fisheries, *Fisheries Statistics of Thailand 2004* Technical Paper No.4/2006 (2006) 14; Department of Fisheries, *Fisheries Statistics of Thailand 2012*, Technical paper No.9/2014 (2014) 14.

[40] Ibid 21, 24.

[41] Ibid 57.

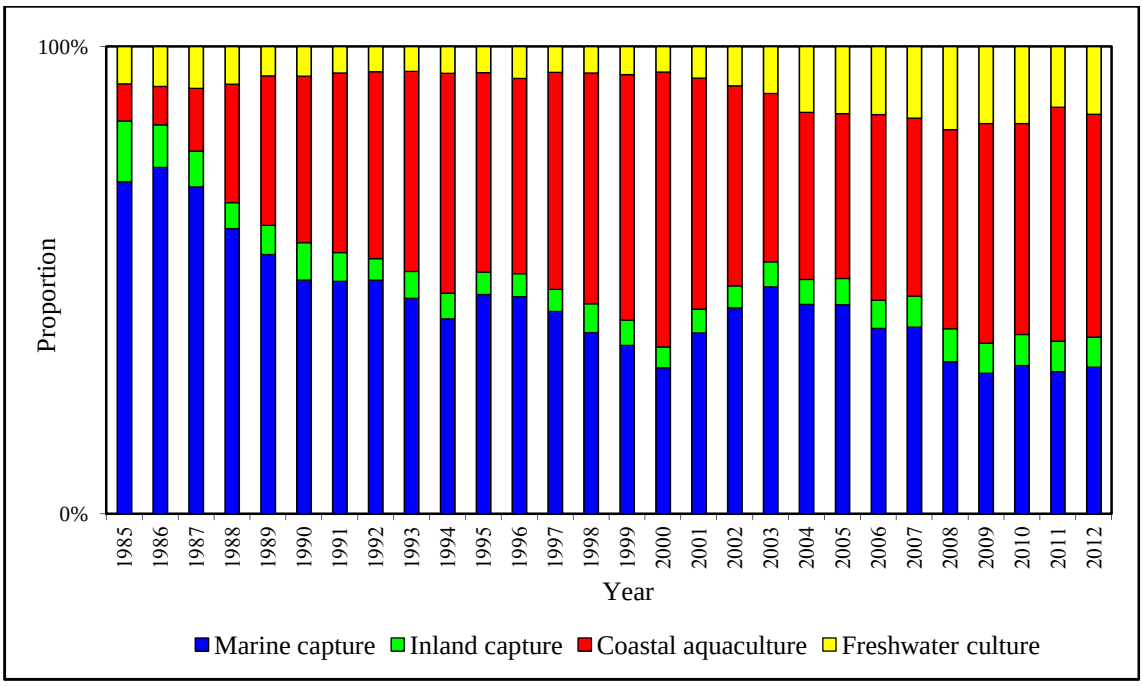

Figure 2.6: Proportion of value of fisheries production by sub-sectors during 1985-2012

Source of data: Department of Fisheries, *Fisheries Statistics of Thailand 2004* Technical Paper No.4/2006 (2006) 14; Department of Fisheries, *Fisheries Statistics of Thailand 2012*, Technical paper No.9/2014 (2014) 14.

2.2.2 Thai Marine Capture Fisheries beyond National Jurisdiction

The expansion of Thai fisheries beyond national jurisdiction started in 1965, after the introduction of trawl gear to Thailand in 1960.[42] During this period, Thai fishing fleets roamed on the high seas under the principle of freedom of fishing.[43] However, following the introduction of the EEZ concept in the international law, initially as fisheries zones and crystallised within the 1982 *United Nations Convention on the Law of the Sea* (*LOSC*),[44] Thai fishing fleets had to return to Thailand. There was a subsequent attempt to secure overseas fishing grounds with success. These fishing

[42] Fisheries Foreign Affairs Division, *The Analysis and Assessment of Thai Fisheries Status in Distant Waters* (2011).

[43] The concept of the freedom of the seas was introduced by the Dutch jurist Hugo Grotius in the 1609 treatise *Mare Liberum*. See, Hugo Grotius, 'The Freedom of the Seas, or the Right Which Belongs to the Dutch to Take Part in the East Indian Trade' (1916) <http://lf-oll.s3.amazonaws.com/titles/552/Grotius_0049_EBk_v6.0.pdf>.

[44] *LOSC* part V.

grounds are in the EEZs of other coastal States and on the high seas. As a result, Thailand has become a distant water fishing nation (DWFN).[45]

2.2.2.1 Thai Fisheries in EEZs of other Coastal States

In the 1970s, neighbouring States of Thailand claimed EEZs expanding to 200 nautical miles from their baselines. This decreases about 300,000 square kilometres of fishing areas that had been utilised by Thai fishing fleets under the freedom of the high seas.[46] These fleets, therefore, had to come back to fish in the national EEZ, and have increased the intensity of fishing efforts in Thai waters, both in the Gulf of Thailand and the Andaman Sea. This has compounded the problem of overexploitation of fisheries in Thai waters. The substantial decline of Catch Per Unit of Effort (CPUE) from the trawl surveys annually conducted in the Gulf of Thailand,[47] as well as the species composition of the catch changing to less valuable and smaller aquatic species in the past years confirm this problem.[48] Consequently, the canned fish industry has been impacted by the lack of raw products.

In addition, after the declaration of EEZs by neighbouring States, during 1986-1995 in particular, the number of Thai fishers arrested by neighbouring States increased from 1,159 to 3,381 people[49] because of increased enforcement by these States and the lack of knowledge by Thai fishers of the new developments in the *LOSC*. However, this number significantly dropped since 1996 (745 people)[50] as a number of bilateral fishing arrangements between Thailand and these States have been negotiated. For instance, three shared areas between Thailand and Cambodia, Thailand and Vietnam, and

[45] David J Doulman, 'Structure and Process of the 1993-1995 United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks' (FAO Fisheries Circular No. 898, FAO, 1995) <http://www.fao.org/docrep/V9929E/V9929E00.htm>.

[46] Ted L McDorman, 'Thailand's Fisheries: A Victim of 200 Mile Zones' (1986) 16(2) (1986/01/01) *Ocean Development & International Law* 183.

[47] Thailand, by the Department of Fisheries, has conducted annual scientific surveys in Thai waters (i.e., the Gulf of Thailand and the Andaman Sea) by research vessels (trawlers) since the 1960s. Details about the decreased CPUE is greatly discussed in section 2.4.

[48] Amnuay Kongprom et al, 'Status of Demersal Fishery Resources in the Gulf of Thailand' in Geronimo T Silvestre et al (eds), *Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries* (WorldFish Center, 2003) vol 67, 138.

[49] Sampan Panjarat, 'Sustainable Fisheries in the Andaman Sea Coast of Thailand' (Division of Ocean Affair and the Law of the Sea, Office of Legal Affairs, the United Nations, 2008) 21.

[50] Ibid.

Thailand and Malaysia, covering a total 55,200 square kilometres, have been established.[51]

With the Thai government's support, Thai fishers have explored the new fishing areas beyond Thai waters in order to increase their catch production and secure the food supply for domestic consumption and the fish processing industries. The fishing operations outside Thai waters are conducted through a number of forms of arrangements,[52] including fishing contracts between government and government, or government and private sector, or private sector and private sector. Nonetheless, two forms of arrangements are mainly conducted, namely, licensing and joint venture. Thai distant water fishing fleets have operated under fishing arrangements in coastal States' EEZs of four regions, i.e., Southeast Asia (Cambodia, Vietnam, Myanmar, Indonesia, and Malaysia), South Asia (India and Bangladesh), the Middle East (Oman, Yemen, and Iran), and the Pacific (Papua New Guinea).[53]

The Thai government have encouraged Thai fishers to legally conduct distant water fishing and carry the fish back to Thailand by giving either an exemption or decreased rate of duty to such imported fish, depending on fish species.[54] For example, Yellowfin tuna, Bigeye tuna, Skipjack tuna, and Albacore fished in Bangladesh waters, are exempted from import duty.[55] However, in order to receive this benefit, the fishers are required to register for distant water fishing licenses issued by the Department of Fisheries. In 2006, there were only 759 units of Thai vessels fishing in the EEZs of seven coastal States[56] and reported to the Department of Fisheries. However, this figure

[51] FAO, 'Report of the National Seminar on the Reduction and Management of Commercial Fishing Capacity in Thailand, Cha-Am, Thailand, 11-14 May 2004' (FIP/FCR13, FAO, 2005) <http://www.fao.org/docrep/008/j6419e/j6419e00.htm> 39.

[52] Wimol Jantrarotai, *Global Issue on Illegal, Unreported and Unregulated Fishing and its Impacts on Thai Fisheries Development*, Technical paper No.8/2004 (2004).

[53] Fisheries Foreign Affairs Division, above n 42, 5-6.

[54] Marine species mainly transferred back to serve domestic fisheries industry in Thailand include croaker, threadfin bream, bigeye, red snapper, lizardfish, round scad, king mackerel, grouper, Indo-Pacific mackerel, squid, cuttlefish and octopus. See, Marine Fisheries Research and Development Bureau, 'Annual Report 2012' (Department of Fisheries, 2012) <http://www.fisheries.go.th/marine/FormDownload/ANNUAL%20REPORT%202012.pdf> 33.

[55] See, Notification of the Ministry of Finance Re: The exemption of duty and the decrease of duty rate for goods originally come from Bangladesh, given on 31 December B.E. 2549 (2006).

[56] Seven States are Indonesia, Malaysia, Myanmar, Cambodia, India, Somalia and Bangladesh. See, Lymer et al, above n 28, 29.

is a substantial underestimate of the number of Thai vessels fishing outside Thailand's EEZ. As a matter of fact, there were 3,000-4,000 Thai fishing vessels, mainly trawlers, operating in the EEZs of other countries during that period.[57] Most of these vessels operated through the fishing arrangement between private sectors of the countries and thus were not required to report to the Department of Fisheries. Overall, they transferred 1.15 million tonnes of annual catch back to Thailand.[58] The most important fishing grounds of such fishing vessels were the EEZ waters of Indonesia and Myanmar.[59]

Nonetheless, as some coastal States have recently changed the regulations for fishing arrangements in their EEZs, a large number of Thai fishing vessels have difficulties to comply with the new regulations. For example, Indonesia has issued the new regulations stating that only fishing vessels flying Indonesian flags can operate in its EEZ; all catch productions are required to be processed on land in Indonesia; and all fishing vessels need to be equipped with vessel monitoring system (VMS).[60] Many Thai fishing vessels, which are mostly big trawlers, cannot comply with these rules, and thus they must seek other fishing grounds. Some of them return to fish in Thai waters, whereas some can arrange for new fishing contracts in other coastal States' EEZs. For instance, some Thai fishing fleets, which used to fish in Indonesia's EEZ, have moved to fish in Myanmar's EEZ.[61] There are around 1,000 Thai fishing vessels operating in overseas waters and transferring about 800,000-1,000,000 tonnes of fish back to Thailand each year.[62]

Based on 2009 fisheries statistics of Thailand,[63] only the amount of 283,277 tonnes were reported as the catch caught in adjacent water areas[64] of Thai waters (Figure 2.7).

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[57] Jantrarotai, above n 52.

[58] Department of Fisheries, *The Marine Fisheries Statistics 2004 Based on the Sample Survey*, Technical Paper No.11/2006 (2006) 66-107.

[59] Jantrarotai, above n 52.

[60] Fisheries Foreign Affairs Division Department of Fisheries, 'The Potential and Status of Fisheries in Indonesia' (2010) <http://www.fisheries.go.th/foreign/images/stories/fisheries/sarayut2.pdf>. See also, Marine Fisheries Research and Development Bureau, above n 36.

[61] Fisheries Foreign Affairs Division Department of Fisheries, 'Fisheries Cooperation between Thailand and Myanmar' (2010) <http://www.fisheries.go.th/foreign/images/stories/fisheries/sarayut1.pdf>.

[62] Fisheries Foreign Affairs Division, above n 42, 2.

[63] Department of Fisheries, *The Marine Fisheries Statistics 2009 Based on the Sample Survey* Technical Paper No.1/2012 (2012) 68-106.

[64] Adjacent water areas include the EEZs of neighbouring States of Thailand.

The majority of them, accounting 81.46 per cent, came from otter board trawlers. For the remaining, they were the catch from purse seines (15.04 per cent) and pair trawls (3.50 per cent).

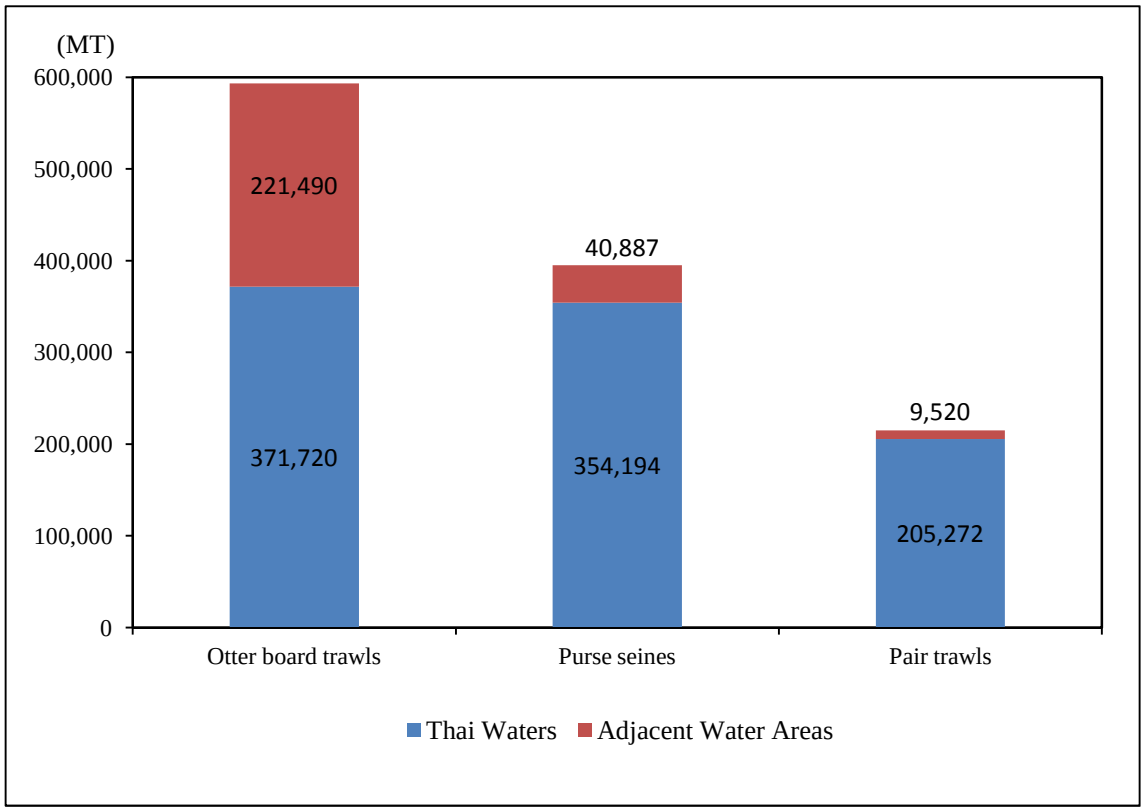

Figure 2.7: Production from Thai fishing vessels operating in adjacent water areas in 2009

Source of data: Department of Fisheries, *The Marine Fisheries Statistics 2009 Based on the Sample Survey*, Technical Paper No.1/2012 (2012).

It is interesting to note that the production obtained from trawlers operating in adjacent water areas substantially contributes 37.4 per cent to the total production caught by Thai trawlers.[65] More regulations imposed by coastal States that would be enforced in the future, could make it more difficult for Thai fishing fleets to access their EEZs, especially trawlers since they are considered a destructive fishing gear, hence deemed as an example of IUU fishing.[66] The catch obtained from adjacent water areas in 2012 (191,686 tonnes) could reflect such constraints as it decreased 32.3 per cent compared with the amount reported in 2009. Further, only otter board trawls and purse seines

[65] This percentage is calculated by using 2009 fisheries statistics of Thailand.

[66] Department of Fisheries, *The Master Plan on Marine Fisheries Management of Thailand* (Department of Fisheries, 2008).

remained operating in adjacent water areas (Figure 2.8). Thus, the problem of the lack of raw material to supply domestic fish processing industries can possibly be confronted by Thailand.

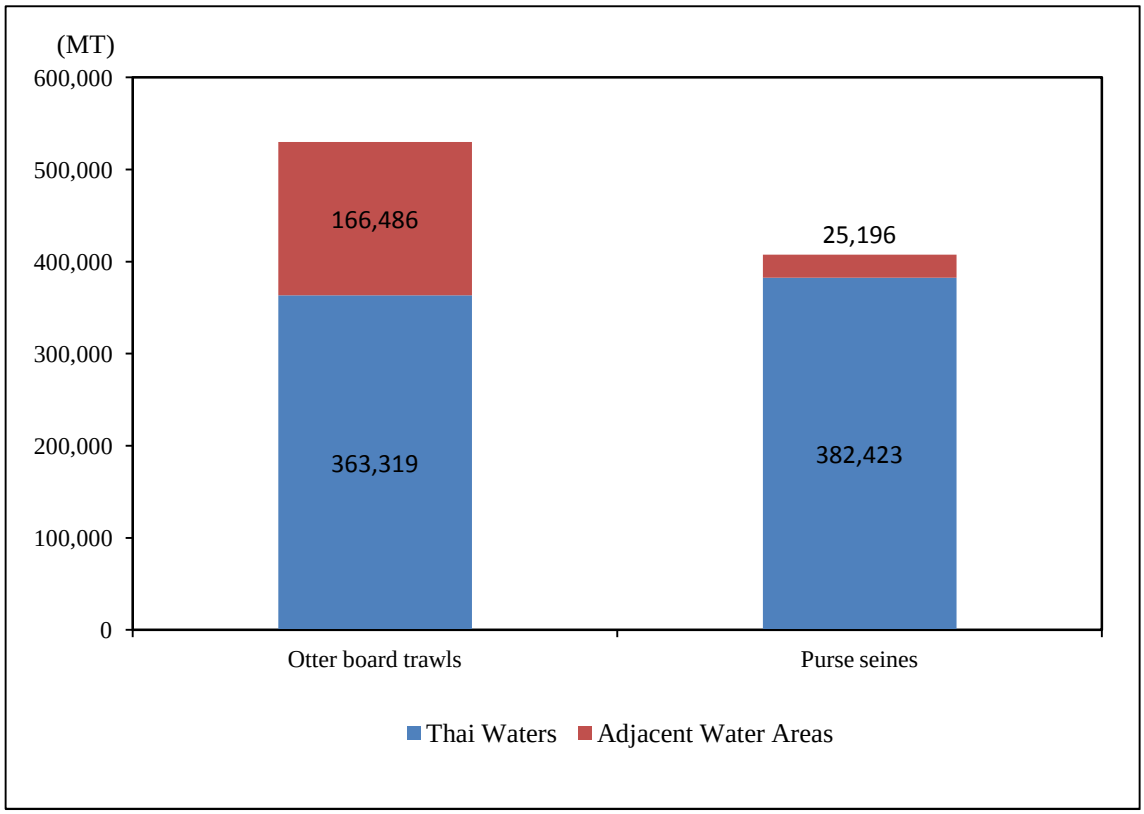

Figure 2.8: Production from Thai fishing vessels operating in adjacent water areas in 2012

Source of data: Department of Fisheries, *The Marine Fisheries Statistics 2012 Based on the Sample Survey*, Technical Paper No.14/2014 (2014).

2.2.2.2 Thai Fisheries on the High Seas

Thailand is the biggest tuna exporter of the world, particularly for canned tuna. But, at the same time, Thailand is one of the top world importers of frozen tuna as well. In 2011, Thailand exported 594,751 tonnes of tuna products overseas with total value of approximately THB60 billion (USD1.88 billion).[67] About 85 per cent of required raw materials are imported from abroad.[68] In 2011, 787,088 tonnes[69] of tuna were imported

[67] This decreased about two per cent by volume due to raw material constrained. See, Nareerat Wiriyapong, 'Tuna Exporters Downbeat on Growth', *Bangkok Post* (Bangkok, Thailand), 24 May 2012, 1 <http://m.bangkokpost.com/business/294808>.

[68] Thai tuna industry requires about 70,000-80,000 tonnes of raw material. See, ibid.

to Thailand, mainly from Taiwan, the United States of America, South Korea, Vanuatu, Japan, the Marshall Islands, Europe and the Maldives.[70] Therefore, in order to support the investment of tuna fisheries aiming to find raw material to serve Thai tuna canning industry, the Thai government, through the Department of Fisheries, has promoted tuna fisheries on the high seas starting with the Indian Ocean. In May 1996, with the support of the Department of Fisheries, Thai fishers who were interested in deep sea fisheries organised a fisher group called the Thai Tuna Oceanic Fishery Cooperative (TOTFIC) to engage in tuna fisheries in the Indian Ocean.[71] Thailand has also been a party of the Indian Ocean Tuna Commission (IOTC) since 17 March 1997.[72]

However, in 2000-2001 Thai tuna fisheries started to operate with the only one tuna purse seine.[73] Its catch obtained in 2000 was 1,530 tonnes, and it reduced to only 763 tonnes in 2001.[74] This was considered unsuccessful and eventually ended. Later in 2005, there were six new purse seiners operating in the Indian Ocean and their annual catch was 11,937 tonnes in total.[75] Another type of tuna fishing gear employed in the Indian Ocean by Thai fishers is tuna longline. Tuna longline fisheries of Thailand have commenced in year 2000 with two vessels and expanded to six vessels in 2005.[76] Both Thai tuna purse seines and longlines mainly operate in the Western Indian Ocean (i.e., Area 51 of FAO Statistical Areas).[77] Currently, Thailand has 13 vessels authorised by

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[69] It decreased about 5.3 per cent by volume based on the declining supply of tuna. Thai tuna industry also shoulders higher costs. For example, the cost and freight (CFR) price of Skipjack raw material in Bangkok has raised for 96 per cent within five years, from USD918 in 2006 to about USD1,800-2,025 per tonne in 2011. See, ibid.

[70] Ibid.

[71] Poreeyanond Dhammasak, 'Review of Tuna Fishing in Thailand' (Paper presented at the IOTC Meeting, 1998) <http://www.iotc.org/files/proceedings/1998/ec/IOTC-1998-EC7-10.pdf> 58.

[72] IOTC, *Structure of the Commission: Commission Contracting Parties (Members)* (2015) <http://www.iotc.org/about-iotc/structure-commission>. Later, Thailand has become a cooperating non-member of the Western and Central Pacific Fisheries Commission (WCPFC). See, The Western and Central Pacific Fisheries Commission, *About WCPFC* (4 February 2015) <https://www.wcpfc.int/about-wcpfc>.

[73] Panjarat, above n 49, 23.

[74] IOTC, *Nominal Catch Data for IOTC Species* (25 May 2012) <http://www.iotc.org/English/data/databases.php#dl>.

[75] Ibid.

[76] Panjarat, above n 49, 23.

[77] FAO, *Indian Ocean, Western (Major Fishing Area 51)* (2012) FAO <http://www.fao.org/fishery/area/Area51/en>.

the IOTC to fish in the Indian Ocean. These include ten longliners and three research-training vessels.[78]

Apart from tuna fishing vessels mentioned above, Thailand has other fishing fleets operating in the Eastern Indian Ocean (i.e., Area 57 of FAO Statistical Areas).[79] These fishing vessels (>18 metres in length overall) are small purse seines, gill nets, and trawlers. The annual catch obtained by all Thai fishing vessels operating in the Indian Ocean is presented in Table 2.2. Based on IOTC statistics during 2000-2013, important species caught from the Indian Ocean by Thai fishing fleets are composed of Kawakawa (31.6 per cent), Longtail tuna (20.4 per cent), Scomberomorini (19.7 per cent), and Skipjack tuna (14.9 per cent).[80]

Thailand tuna fisheries are still in its primary development stage. The development of Thai tuna fisheries is apparently slow due to constraints in terms of modern fishing technology and private investors. Only new private investors have expressed their interest to engage in tuna fisheries as it is difficult for current fishers to modify their vessels and equipment to fish on the high seas.[81] In order to strengthen the support for distant water fisheries, the Thai government, through the Department of Fisheries, has included strategic measures and guidelines to promote and develop distant water fisheries within the Master Plan for Marine Fisheries of Thailand.[82]

[78] IOTC, *Record of Currently Authorised Vessels* (2015) <http://www.iotc.org/vessels/current>.

[79] FAO, *Indian Ocean, Eastern (Major Fishing Area 57)* FAO <http://www.fao.org/fishery/area/Area57/en>.

[80] IOTC, *Nominal Catch by Species and Gear, by Vessel Flag Reporting Country* (1 October 2014) <http://www.iotc.org/documents/nominal-catch-species-and-gear-vessel-flag-reporting-country>.

[81] Panjarat, above n 49, 24.

[82] Department of Fisheries, above n 66.

Table 2.2: Annual catch by Thai fishing vessels operating in the Indian Ocean

Year	Catch (MT)				
	Purse Seines	Small Purse Seines	Tuna Longlines	Gill Nets	Other Fishing Gears
2000	1,530	12,377	385	1,295	2,753
2001	763	8,500	387	1,944	3,393
2002	-	9,247	94	2,322	4,040
2003	-	12,205	254	2,374	3,920
2004	-	11,559	514	778	5,212
2005	11,937	13,582	281	386	6,322
2006	23,492	13,596	530	438	7,191
2007	11,656	14,753	461	645	5,506
2008	9,615	12,824	269	1,036	4,055
2009	11,084	14,795	295	979	3,405
2010	3,629	10,226	608	611	1,826
2011	-	27,524	374	868	1,509
2012	-	18,306	469	619	1,105
2013	-	17,848	344	496	475

Source of data: IOTC, Nominal Catch by Species and Gear, by Vessel Flag Reporting Country (1 October 2014) <http://www.iotc.org/documents/nominal-catch-species-and-gear-vessel-flag-reporting-country>.

2.3 Production, Value and Fishing Effort of Marine Capture Fisheries in Thailand

Marine capture fisheries in Thailand are characterised into small-scale fisheries and large-scale fisheries or commercial fisheries. The definition of small-scale fisheries and large-scale fisheries adopted in this thesis are applied from the definitions provided by the National Statistical Office and the Department of Fisheries, Thailand.[83] The fishing vessels that are non-powered, or outboard powered, or inboard powered vessels less than or equal 10 GT, and normally fishing inshore, are defined as small-scale fisheries. Coastal fishing practices without vessels are also considered small-scale fisheries. On the other hand, fishing vessels of more than 10 GT and fishing practices conducted

[83] National Statistical Office, above n 25; Department of Fisheries, *Thai Fishing Vessels Statistics 2009*, Technical Paper No.2/2011 (2011).

offshore are considered large-scale fisheries. Based on these definitions, the fishing gears utilised for small and large-scale fisheries in Thailand are categorised in Table 2.3.

Table 2.3: Gear-based groups of large-scale and small-scale fisheries

Large-scale fisheries	Small-scale fisheries
1.Otter board trawl	1. Mackerel gill net
2. Pair trawl	2. Mullet gill net
3. Beam trawl	3. Pomfret gill net
4. Purse seine	4. Crab gill net
5. Anchovy purse seine	5. Squid trammel net
6. King mackerel drifting gill net	6. Shrimp trammel net
7. Mackerel encircling gill net	7. Other gill nets
8. Push net	8. Squid falling net
9. Deep water set net	9. Other cast nets
	10. Hand push net
	11. Long line
	12. Hand line and Pole & line
	13. Set bag net
	14. Squid trap
	15. Fish trap
	16. Crab trap
	17. Shallow water set net
	18. Other stationary gears

2.3.1 Small-scale Fisheries

Small-scale fisheries, which are, characteristically, small-scale and labour-intensive operations conducted by artisanal fishers whose level of income is low,[84] are widely practised in coastal areas of Thailand. They are significant not only for the fishing industry but also for the food security of Thailand.[85] In the past days, small-scale fisheries were subsistence fisheries found in communities along the coastal areas of Thailand, and used simple environmentally friendly gears. But according to the fast

[84] Alfredo Sfeir-Younis, 'Small-scale Fisheries Development: a Challenge for the 1980s' (Paper presented at the The Nineteenth Fisheries Symposium Kyoto, Japan, 21-30 May 1980) 1,008.

[85] Plodprasop Suraswadi, 'Community-based Fisheries Management in Phang-nga Bay, Thailand' (Paper presented at the National Workshop on Community-based Fisheries Management, Phuket, Thailand, 14-16 February 1996) 42.

development of large-scale or commercial fisheries, conflicts between small-scale and large-scale fisheries have arisen due to their fights over marine resources and illegal practices by large-scale fisheries in conserved zones,[86] which, in many cases, destroy small-scale fishing gears deployed in these areas.[87] Thus, in order to compete with large-scale fishers for marine resources, small-scale fishers tend to improve their fishing gears or practices, for example, modifying non-motored boat to long-tail boat or powered boat or increasing the amount of fishing gears used. This increases capacity in fisheries and marine resources will be exploited more rapidly. Unless capacity controls are properly implemented, the problem of overfishing in Thailand will worsen.[88]

In the past, little attention was paid to the socio-economic problems confronted by small-scale fishers in Thailand. This was partly because of a presumption that, due to influences of high technology in fisheries, small-scale fishers would eventually move to large-scale fisheries sector, either by operating or becoming labourers, in order to get more income.[89] But, despite their apparently deteriorating standard of living, small-scale fisheries have largely been sustained. This could be due to many reasons, for instance, the absence of alternative employment opportunities,[90] fishers' occupational and geographical immobility.[91]

Because small-scale fisheries involve a large number of poor fishers in fishing villages along the coasts of Thailand, the Thai government has given high priority to projects that improve the living standards of small-scale fishers in rural coastal areas. Such remarkable projects are the Small-scale Fisheries Development Project developed by the

[86] Trawl nets and push nets equipped with powered vessels are banned to operate within the areas of three nautical miles (or 5,556 metres) from the coast line in nine coastal provinces of Thailand. See, the Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited.

[87] Panjarat, above n 49, 39.

[88] Jate Pimoljinda, 'Small-scale Fisheries Management in Thailand' in Heiko E W Seilert (ed), *Interactive Mechanisms for Small-scale Fisheries Management: Report of the Regional Consultation* (Regional Office for Asia and the Pacific, Food and Agriculture Organisation of the United Nations, 2002) vol RAP Publication 2002/10, 153.

[89] Suraswadi, above n 85.

[90] Theodore Panayotou, 'Economic Conditions and Prospects of Small-scale Fishermen in Thailand' (1980) 4(2) *Marine Policy* 142, 146.

[91] Theodore Panayotou and Donna Panayotou, *Occupational and Geographical Mobility in and out of Thai Fisheries,* Fish. Tech. Pap. (FAO, 1986) 53.

Department of Fisheries,[92] the Bay of Bengal Programme (BOBP) project,[93] and the Coastal Habitat and Resources Management (CHARM) project.[94] These projects integrated within the fisheries sector were primarily designed to increase the income of small-scale fishers, which comes from fishing and alternate sources.[95]

Additionally, due to the high costs of fuel, the Department of Fisheries has established a project that promotes sail fishing to small-scale fishers for the purpose of fuel cost saving.[96] A sail designed by the Department of Fisheries can be applied to use with outboard powered boats or long-tail boats, which are the dominant type of small-scale fishing boats in Thailand.

Currently, the Department of Fisheries has adopted the Master Plan for Marine Fisheries Management of Thailand in order to manage marine fisheries as a whole. Details of the Master Plan are discussed in Section 2.6.

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[92] The Department of Fisheries started a small-scale fisheries development project in the early 1990s. The project aimed to provide essential infrastructure to fisheries communities along the coasts, such as landing places, piers, freshwater stocking tanks, gear-repairing shelter, etc. For enhancing the livelihood of fishers, cages and fish fry were supplied, and the fishers were also provided training courses on gear repairing, boat engine maintenance, fish cage culture practices and fish processing. Artificial reef installations were conducted in order to protect inshore areas for small-scale fishers. See, Pimoljinda, above n 84. Some activities of this project, such as artificial reef installations, are still ongoing under the strategies of the Master Plan for Marine Fisheries Management of Thailand adopted in 2010. See, Department of Fisheries, above n 66.

[93] During 1996-2000, the Department of Fisheries in collaboration with FAO/BOBP implemented a project focusing on Phang Nga Bay in the Andaman Sea. This project used the bottom-up approach, so that the objectives of the project were identified, and the confidence of the fishers in fisheries officials was established before the project commenced. The project activities included, for instance, management of mangrove and sea grass resources, sea ranching activity, extension of coastal aquaculture, fishing gear replacement, and establishing a community fish market. See, Pimoljinda, above n 88.

[94] CHARM was a collaborative project between Thailand and the EU, and had a project period of 5 years. It was managed by the Department of Fisheries (Ministry of Agriculture and Cooperatives). This project operated from 25 November 2002 to 24 November 2007. The project was implemented in two project areas: Ban Don Bay in the Gulf of Thailand, and Phang Nga Bay in the Andaman Sea. The objectives of the project were to encourage better natural resource utilisation in Thai coastal areas. Particular emphasis was placed on improving management processes and the participation and involvement of stakeholders living in coastal areas or using coastal resources. See, CHARM, 'Successes and Lessons Learned for Future Coastal Resource Co-Management from CHARM's End-of-Project Workshop' (22-24 August 2007) <http://www.charmproject.org/cms/Final_work/EOPWSproc.pdf> 47.

[95] Wetchagarun, above n 32, 658.

[96] Department of Fisheries, *Experiment on Using a Sail with Fibreglass Boat for a Purpose of Fishing* <http://www.fisheries.go.th/marine/Boat/TestBoat/Boat_Test.htm>.

2.3.1.1 Fishing Effort of Small-scale Fisheries

The traditional feature of Thai fisheries is the large numbers with different sizes of fishing vessels, which employ multi-gear in multi-fisheries. This complexity is particularly found in small-scale fisheries, similar to the fisheries in other tropical areas.[97] Unlike large-scale fisheries, small-scale fisheries are generally viewed as being on subsistence basis by using low-efficiency fishing gears, which have a low impact on fishery resources. Therefore, some small-scale fishing gears are not legally required to obtain fishing licenses and boat registration for the purpose of fee exemption.[98] Furthermore, there are always some occupational and geographical migrations in and out of the fishing industry by small-scale fishers. It is because they are more influenced by economic incentives and change careers in order to gain the most benefits.[99] Thus, the accurate number of small-scale fishing units in Thailand is difficult to obtain.

Based on fishing vessel statistics of Thailand published by the Department of Fisheries during 1999-2012 (Figure 2.9), the number of small-scale fishing vessels has demonstrated a declining trend from 1999 to 2006. The number started to rise again in 2007 and enormously increased in 2009 with 8,421 vessels.[100] This is because small-scale fishing gears, which were not legally required to obtain license due to their small size, now need to be licensed in order to avoid a violation of the EU-IUU Regulation[101]

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[97] Theodore Panayotou, *Management Concepts for Small-scale Fisheries: Economic and Social Aspects* (FAO, 1982).

[98] Suraswadi, above n 85, 43.

[99] Panayotou and Panayotou, above n 91.

[100] Department of Fisheries, above n 83, 36.

[101] The EU-IUU Regulation stands for the Council Regulation (EC) No. 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations (EEC) No. 2847/93, (EC) No. 1936/2001 and (EC) No. 601/2004 and repealing Regulations (EC) No. 1093/94 and (EC) No. 1447/1999.

The 'Community' is referred to 'a Contracting Party to the United Nations Convention on the Law of the Sea of 10 December 1982 (UNCLOS), has ratified the United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 4 August 1995 (the UN Fish Stocks Agreement) and has accepted the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993 of the Food and Agriculture Organisation of the United Nations (FAO Compliance Agreement). Those provisions predominantly set out the principle that all States have a duty to adopt appropriate measures to ensure sustainable management of marine resources and to cooperate with each other to this end.' See, the EU-IUU Regulation para (1).

that has been implemented by the European Union since January 2010.[102] The added number of vessels is for vessels employed with these small-scale fishing gears, such as gill nets, hooks and small traps.[103] The registered number of small-scale fishing vessels has increased to 9,398 in 2012 with a majority of gill nets (75 per cent).[104]

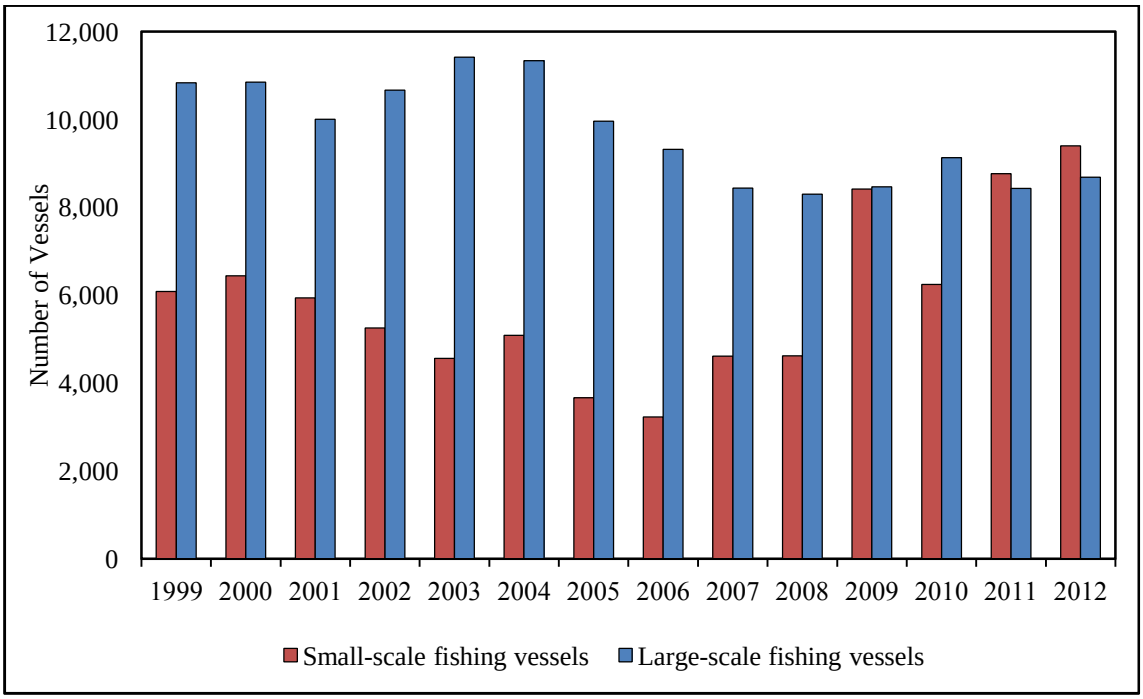

Figure 2.9: Number of small-scale and large-scale fishing vessels registered during 1999 to 2012

Source of data: Department of Fisheries, *Thai Fishing Vessels Statistics 1999-2012*.

Nonetheless, the figure mentioned above is considered an underestimate. The best estimate for small-scale fishing units employed in the marine capture fisheries of Thailand is 60,141 units of which 78.90 per cent are outboard powered boats or long-tail boats (Table 2.4).[105] The average number of crews per fishing vessel is depended on the size of the vessel, as is the profit obtained per fishing vessel. The average number of crews per small-scale fishing vessel is one to three persons, and the total number of

[102] The EU-IUU Regulation entered into forced for the European Union on 1 January 2010. This regulation aims to prohibit IUU fishing by ensuring that all traded fishery products imported into or exported from the Community have been fished in compliance with international conservation and management measures and other related rules applying to the fishing vessel concerned. A certification scheme applying to all trades in fishery products with the Community will therefore be put into effect. See, the EU-IUU Regulation para (13).

[103] Department of Fisheries, above n 83, 36.

[104] Department of Fisheries, *Thai Fishing Vessels Statistics 2012*, Technical Paper No.2/2014 (2014) 30.

[105] Lymer et al, above n 28, 28.

fishing households is 53,343. In peak fishing season, there are 94,229 fishers involved in small-scale fisheries[106] (Table 2.4).

Table 2.4: Numbers of fishing units, households and fishers of small-scale fisheries in Thailand

Type of fishing units	Number of registered fishing vessels (2009)[a]	Number of registered fishing vessels (2012)[c]	Best estimated number[c]	Average crew per fishing unit[c]	Number of fishing households[c]	Number of fishers (peak season)[c]
No boat			3,763	1	3,550	4,962
Non-powered boat			2,876	1	2,559	3,282
Outboard powered boat	5,873	7,539	47,457	2	41,225	71,386
Inboard powered boat < 5 GT			3,336	2	3,249	6,170
5-10 GT	2,548	1,859	2,709	3	2,760	8,429
Total	8,421	9,398	60,141		53,343	94,229

Source of data: [a] Department of Fisheries, *Thai Fishing Vessels Statistics 2009*, Technical Paper No.2/2011 (2011) 36; [b] Department of Fisheries, *Thai Fishing Vessels Statistics 2012*, Technical Paper No.2/2014 (2014) 30; [c] David Lymer et al, *A review and Synthesis of Capture Fisheries Data in Thailand: Large versus Small-scale Fisheries*, RAP Publication 2008/17 (2008) 28.

Generally, the income of small-scale fishers in Thailand comes from two sources, i.e., from fishing and non-fishing activities. Income from fishing activities is obtained from three sources: their own fishing business, fishing labour, and fish processing, whereas non-fishing income is obtained from farming, hired labour and others.[107] Thus, there is a variety of sources of income for small-scale fishers. However, the amount of their income is generally uncertain, particularly in monsoon seasons when fishers must suspend their operations because of bad condition at sea. In terms of the costs of operation, fuel takes the greatest part for small-scale fisheries. It is usually more than 50 per cent of total cost.[108] Based on the surveys conducted with fishers who use crab gill

[106] Ibid.

[107] Somying Rientrairut, Somying Rientrairut, *Small-scale Fisheries Development in Thailand*, FAO/UNDP South China Sea Fisheries Development and Coordinating Programme (UNDP/FAO, 1985). Additionally, in fishing villages located in rural areas, small-scale fishers usually have to buy fuel with higher price than it is in urban areas. See, Panjarat, above n 49.

[108] Panjarat, above n 49, 38.

nets, mullet gill nets, and shrimp trammel nets that are the dominant types of small-fishing gears in Thailand,[109] the average total cost is THB4,018 (USD125.6) per month per household, whereas the average total income is THB9,973 (USD311.7) per month per household.[110] The average net profit gained by these small-scale fisheries is therefore only THB5,955 (USD186.1) per month or THB71,460 (USD2,233.1) per year per household. This is considered low income compared with the national income per capita of THB131,579 (USD4,111.8).[111]

2.3.1.2 Production and Value of Small-scale Fisheries

In 2009, the amount of marine fisheries production obtained from small-scale fisheries is 278,413 tonnes according to the fisheries statistics of Thailand,[112] which contributes 16.73 per cent to total marine capture production (1,663,846 tonnes).[113] Among all types of small-scale fishing gears or practices, squid falling nets provide the highest production (26,260 tonnes) followed by collecting shellfish (22,395 tonnes) and various types of gill nets (7,718-19,811 tonnes) (Figure 2.10).[114]

[109] Department of Fisheries, *Thai Fishing Vessels Statistics 1999-2012*.

[110] National Statistical Office, above n 25.

[111] This is a national income per capita of Thailand in 2013. See, Office of the National Economic and Social Development Board, 'National Income of Thailand 2013, Chain Volume Measures' (January 2015) <http://eng.nesdb.go.th/Portals/0/eco_datas/account/ni/cvm/2013/Book_NI_2013ENG.pdf> 39.

[112] This data is collected from fishing gears or fishing practices, which are defined as small-scale fisheries by the Department of Fisheries. See, Department of Fisheries, *Fishing Community Production Survey in 2009*, Technical Paper No.4/2011 (2011).

[113] Department of Fisheries, above n 63, 26.

[114] Department of Fisheries, above n 112.

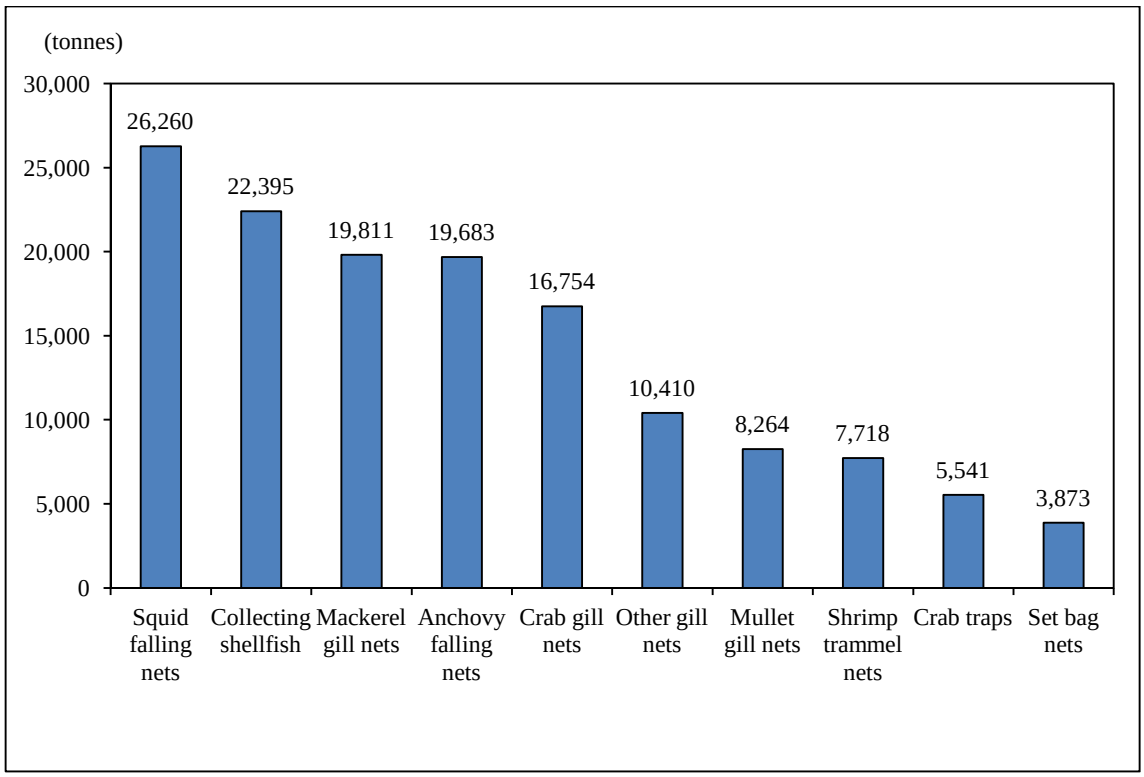

Figure 2.10: Marine capture production obtained from important small-scale fishing gears in 2009

Source of data: Department of Fisheries, *Fishing Community Production Survey in 2009,* Technical Paper No.4/2011 (2011).

With regard to species composition of small-scale fisheries production, jellyfish is the dominant production (117,816 tonnes or 42.32 per cent), followed by pelagic fish (53,467 tonnes or 19.20 per cent), squids and cuttle fish (27,996 tonnes or 10.06 per cent), and crabs (22,723 tonnes or 8.16 per cent) (Figure 2.11). Apart from jellyfish and squids, important species from small-scale fisheries are anchovies (19,550 tonnes), Indo-Pacific mackerel (19,239 tonnes), blue swimming crabs (19,057 tonnes), and short necked clams (17,763 tonnes).[115]

[115] Department of Fisheries, above n 112.

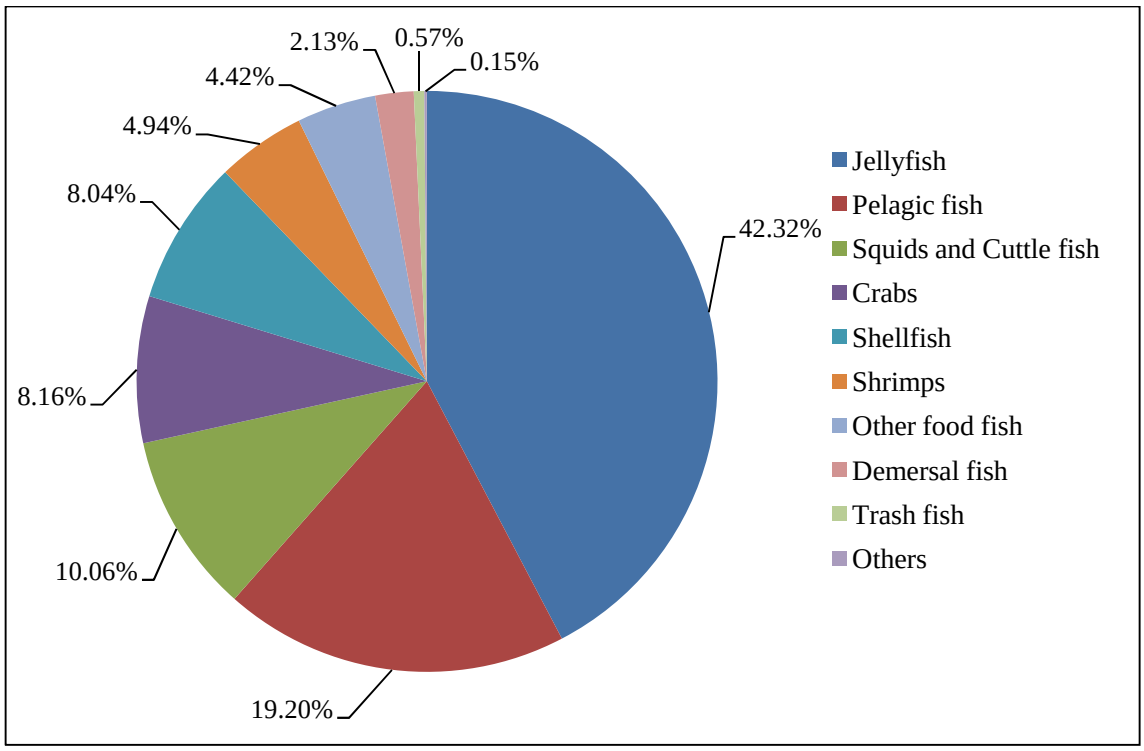

Figure 2.11: Composition of marine capture production obtained from small-scale fisheries in 2009

Source of data: Department of Fisheries, *Fishing Community Production Survey in 2009*, Technical Paper No.4/2011 (2011).

In value terms, small-scale fisheries production contributes 20.03 per cent (THB8,564 million or USD267.6 million)[116] to total value of marine fisheries production (THB42,758.1 million or USD1,336.2 million).[117] Among all types of small-scale fishing gears, squid falling nets generate the highest value (THB1,774.8 million or USD55.5 million), followed by crab gill nets (THB1,711 million or USD53.5 million), shrimp trammel nets (THB1,119.1 million or USD35.0 million), and crab traps (THB614.3 million and USD19.2 million) (Figure 2.12).

In terms of species, small-scale fisheries obtain the highest value from crabs 27.89 per cent (THB2,388.7 million or USD74.6 million), followed by squids and cuttle fish 24.13 per cent (THB2,066.3 million or USD64.6 million), and pelagic fish 17.65 per cent (THB1,511.4 million or USD47.2 million) (Figure 2.13).

[116] Ibid.

[117] Department of Fisheries, above n 37, 34.

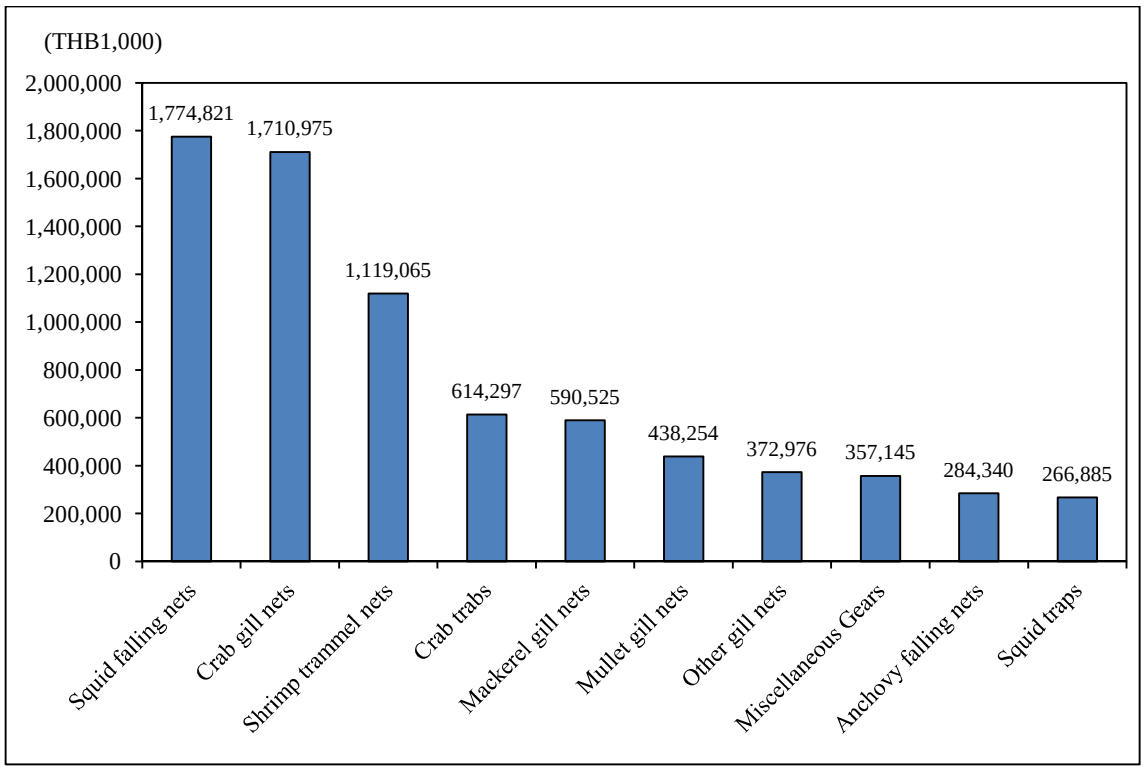

Figure 2.12: The value of marine capture production obtained from important small-scale fishing gears in 2009

Source of data: Department of Fisheries, *Fishing Community Production Survey in 2009*, Technical Paper No.4/2011 (2011).

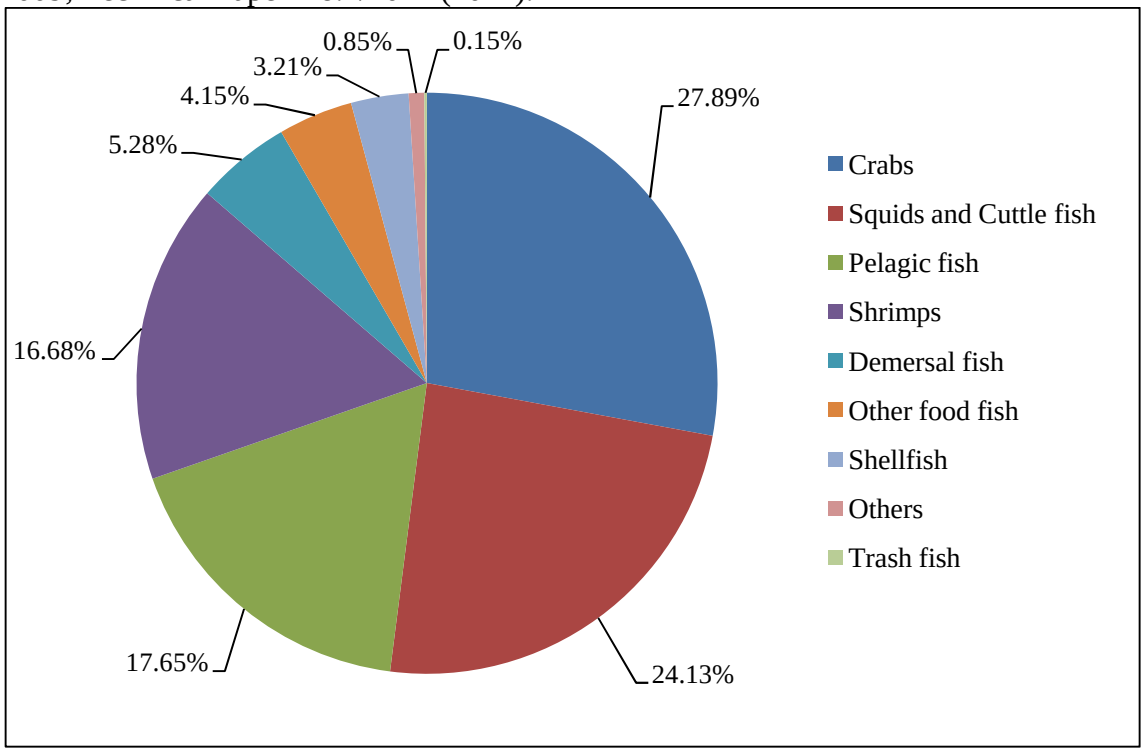

Figure 2.13: Composition of the value of marine capture production obtained from small-scale fisheries in 2009

Source of data: Department of Fisheries, *Fishing Community Production Survey in 2009*, Technical Paper No.4/2011 (2011).

2.3.2 Large-scale Fisheries

As mentioned in Section 2.2.1 above, marine fisheries, particularly large-scale fisheries, in Thailand have developed due to modern fishing gears and technologies, migration of fishing vessels to new fishing areas, improved fishing vessels, and support in terms of facilities and infrastructure.[118] Marine fisheries of Thailand were basically artisanal until 1961, when otter board trawlers were systematically introduced to Thai fishers based on the success of demonstrations of using a trawl net under a project through bilateral agreement between the Federal Republic of Germany and Thailand.[119] Since then, the growth of Thai marine fisheries greatly increased, both in the number of fishing units and catch production. In 1963, there were 2,327 registered trawlers and 323,000 tonnes obtained from marine capture fisheries, which doubled from 1960 (146,000 tonnes) because of the high efficiency of trawlers.[120]

Prior to the advent of otter board trawlers, the main composition of marine production consisted of small pelagic species caught inshore by stationary type of fishing gears and simple purse seines, as well as invertebrates and molluscs caught by traditional fishing methods.[121] After expansion of trawlers, demersal species, which are target species of trawlers, significantly contributed the catch composition. Besides, there was another fast development in the early 1980s by purse seine fisheries aiming to catch pelagic species for fish canning industry.[122] The remarkable developments of purse seine fisheries included the discovery of fishing grounds of round scads in the central part of the Gulf of Thailand in 1973, development of light luring fishing techniques to catch small pelagic since 1978, development of large purse seines for coastal tunas, hardtail scads and trevallies in deeper waters since 1982, and the development of anchovy fisheries

[118] Menasveta, above n 30, 98.

[119] The program was carried out in two phases from 23 May to 11 September 1961, and from 27 July 1962 to 9 October 1964. A total of 23 research cruises, comprising 471 hauls amounting to 822 trawling hours, demonstrated that there were excellent possibilities for a commercial trawl fishery along the entire coast of the Gulf of Thailand in depths to 50 metres. See, Klaus Tiews, 'The Development of Trawl Fisheries in Southeast Asian Countries as A Means of Increasing Marine Fisheries Production' 79.

[120] Ibid.

[121] Wetchagarun, above n 32, 660.

[122] Pakjuta Khemakorn, 'Sustainable Management of Pelagic Fisheries in the South China Sea Region' (The United Nations - The Nippon Foundation of Japan Fellowship, DOALOS, Office of Legal Affairs, the United Nations, 2006) 29.

with light luring since 1983.[123] All of these developments have resulted in the increase of pelagic fish production shared in the total marine production of the Gulf of Thailand. This leads pelagic fisheries to be one of the most important fisheries in Thailand.[124] Based on all developments in Thai fisheries in the past decades, Thailand has then been one of the top ten global producers of fish and fisheries products.[125]

2.3.2.1 Fishing Effort of Large-scale Fisheries

The *Thai Fisheries Act B.E. 2490 (1947)* requires that large-scale fishing gears to be licensed and large-scale fishing vessels to be registered.[126] But in practice, to avoid expenses of tax and fees of being licensed and registered, some large-scale fishers do not to comply. This makes the recorded number of large-scale fishing vessels in Thailand to be underestimated. According to the latest Thai fishing vessel statistics published by the Department of Fisheries, 8,691 large-scale fishing vessels are registered, of which 42.04 per cent are vessels sized between 20 to 50 GT (Table 2.5).[127] However, based on best estimates, it is found that there are 11,343 large-scale fishing vessels in total.[128] The majority are also vessels in size between 20 to 50 GT (41.14 per cent or 11,343 units). Similar to small-scale fisheries, the average number of crews per fishing vessel is depended on the vessel size, as is the net profit per vessel. The average number of crews per large-scale fishing vessel is seven to 26 people. The total number of fishing households is 4,458. In peak fishing season, there are 73,911 fishers involved in large-scale fisheries (Table 2.5).[129]

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[123] Somsak Chullasorn, 'Review of the Small Pelagic Resources and their Fisheries in the Gulf of Thailand' (Paper presented at the the First Session of the APFIC Working Party on Marine Fisheries, Bangkok, Thailand, 13-16 May 1997).

[124] Pakjuta Khemakorn et al, 'Fishery and Biological Information of Small Pelagic Fisheries in the South China Sea Case Study: Gulf of Thailand, 2002-2006' (2007) 11.

[125] FAO, 'Report of the Twenty-eighth of the Asia-Pacific Fishery Commission, 3-5 August 2004' (RAP Publication 2004/19, 3-5 August 2004) <http://www.fao.org/docrep/007/ad510e/ad510e00.htm#Contents> 3; FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2006* (FAO, 2007) 11.

[126] The obligation is based on the *Thai Fisheries Act B.E. 2490 (1947)* section 26 and the *Thai Vessels Act B.E. 2481 (1938)* section 5(6). Details are discussed in Section 2.5.

[127] Department of Fisheries, above n 104.

[128] Lymer et al, above n 28, 28.

[129] Ibid.

Table 2.5: Numbers of fishing units, households and fishers of large-scale fisheries in Thailand

Type of fishing units	Number of registered fishing vessels (2009)[a]	Number of registered fishing vessels (2012)[b]	Best estimated number[c]	Average crew per fishing unit[c]	Number of fishing households[c]	Number of fishers (peak season)[c]
10-20 GT	2,442	2,280	3,378	7	1,994	9,957
20-50 GT	3,539	3,654	4,667	10	1,340	12,597
50-100 GT	2,124	2,301	2,799	13	517	10,682
100-200 GT	349	442	438	22	607	40,675
200-500 GT	12	14	59	26		
> 500 GT	4	-	2	NA		
Total	8,470	8,691	11,343		4,458	73,911

Source of data: [a] Department of Fisheries, *Thai Fishing Vessels Statistics 2009,* Technical Paper No.2/2011 (2011) 36; [b] Department of Fisheries, *Thai Fishing Vessels Statistics 2012,* Technical Paper No.2/2014 (2014) 30; [c] David Lymer et al, *A review and Synthesis of Capture Fisheries Data in Thailand: Large versus Small-scale Fisheries,* RAP Publication 2008/17 (2008) 28.

The average total cost and income of large-scale fisheries categorised by size are summarised in Table 2.6. Overall, it clearly shows that although fishing units with bigger size spend for both cash cost and non-cash cost more than smaller ones, they make more net profit too. The bigger the vessel is, the more net profit it gets. For example, fishing vessels of size 20-50 GT are able to make only 15.09 per cent of total cost for net profit, whereas fishing vessels of size 100-500 GT can make 126.52 per cent. This big profit is the most significant factor that attracts fishers to enter large-scale fisheries.

Table 2.6: Cost and income of large-scale fisheries in Thailand

Type of fishing units	Cash cost[130]	Non-cash cost[131]	Total cost	Total income	Net profit
Large-scale fisheries (THB/month/vessel)					
10-20 GT	85,136	7,617	92,753	96,116	3,363
20-50 GT	233,865	11,152	245,017	281,982	36,965
50-100 GT	340,081	15,020	355,101	400,133	45,032
100-200 GT	353,352	13,415	366,767	830,800	464,033
200-500 GT					

Note: Surveyed from otter board trawlers, pair trawlers, beam trawlers, and push netters

Source of data: David Lymer et al, *A Review and Synthesis of Capture Fisheries Data in Thailand: Large Versus Small-scale Fisheries*, RAP Publication 2008/17 (2008) 28.

2.3.2.2 Production and Value of Large-scale Fisheries

Large-scale fisheries in Thai waters contribute 1,102,156 tonnes (66.24 per cent) to the total marine production of Thailand.[132] Otter board trawl production contributes the highest production share of large-scale fishing gears, 371,720 tonnes, which in fact is the highest production among all types of fishing gears (22.34 per cent of total marine production).[133] It is followed by purse seine and pair trawls fisheries, which are 354,194 and 205,272 tonnes, respectively (Figure 2.14).

[130] Cash costs are costs that businesses pay for when using cash, or a check, but not credit. See, Investopedia, *Cash Cost* <http://www.investopedia.com/terms/c/cashcost.asp#axzz21X4ErqfX>. In fisheries, cash costs can be cash expenses for ice, fuel, lubricants, groceries, crew share/wages, repairs and maintenance, etc.

[131] Non-cash costs are costs that business pay for when using credit, not cash or a check. In fisheries, non-cash costs can be interest on capital (vessel, gear, vehicle, others) and depreciation (vessel, gear, vehicle, others).

[132] Department of Fisheries, above n 63, 26.

[133] Ibid.

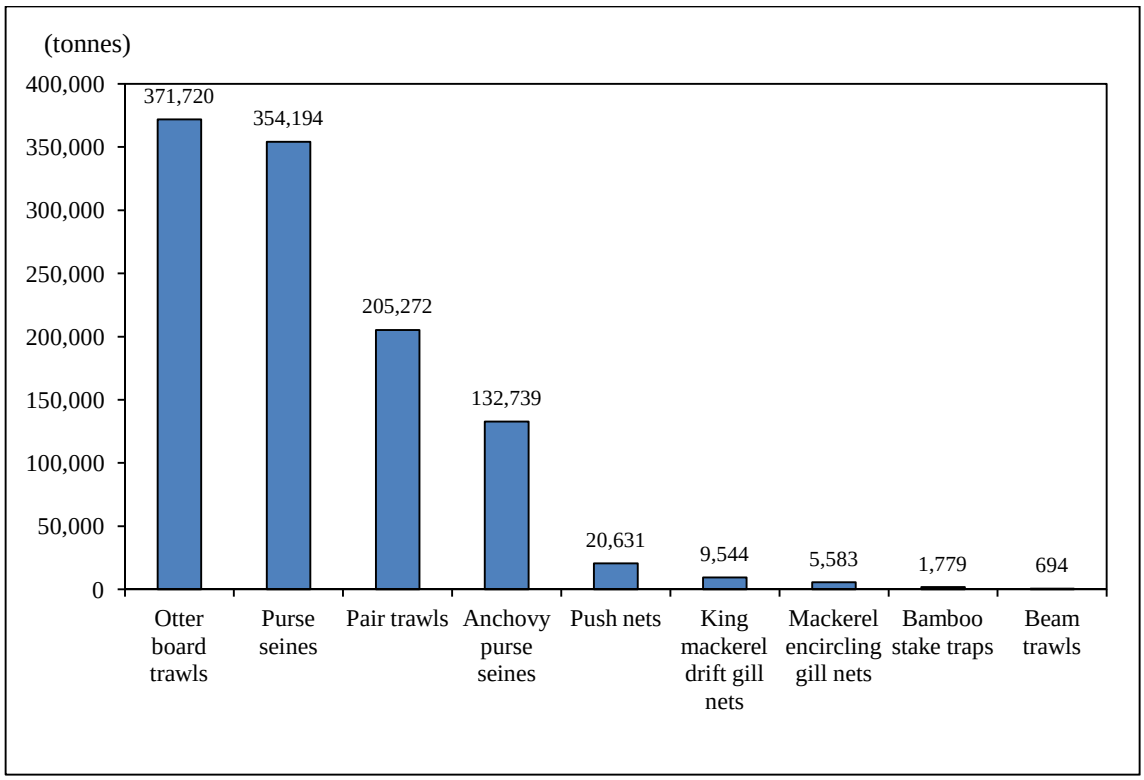

Figure 2.14: Marine capture production obtained from large-scale fishing gears in 2009

Source of data: Department of Fisheries, *The Marine Fisheries Statistics 2009 Based on the Sample Survey*, Technical Paper No.1/2012 (2012).

In terms of catch composition of large-scale fisheries production, pelagic fish is the dominant production (527,904 tonnes or 38.11 per cent), followed by trash fish[134] (467,216 tonnes or 33.72 per cent) and demersal fish (161,208 tonnes or 11.64 per cent) (Figure 2.15). Important species caught by large-scale fishing gears are anchovies, sardines, Indo-Pacific mackerels, squids, threadfin breams, trevallies and round scads.[135]

[134] "Trash fish" refers to the catch of all sizes of uneatable fish (or true trash fish) and the catch of small sizes of commercial fish. Trash fish are generally used as raw materials for producing fish meal or feed for fish aquaculture (farming). See, Panjarat, above n 49, 12.

[135] Department of Fisheries, above n 63, 26-39.

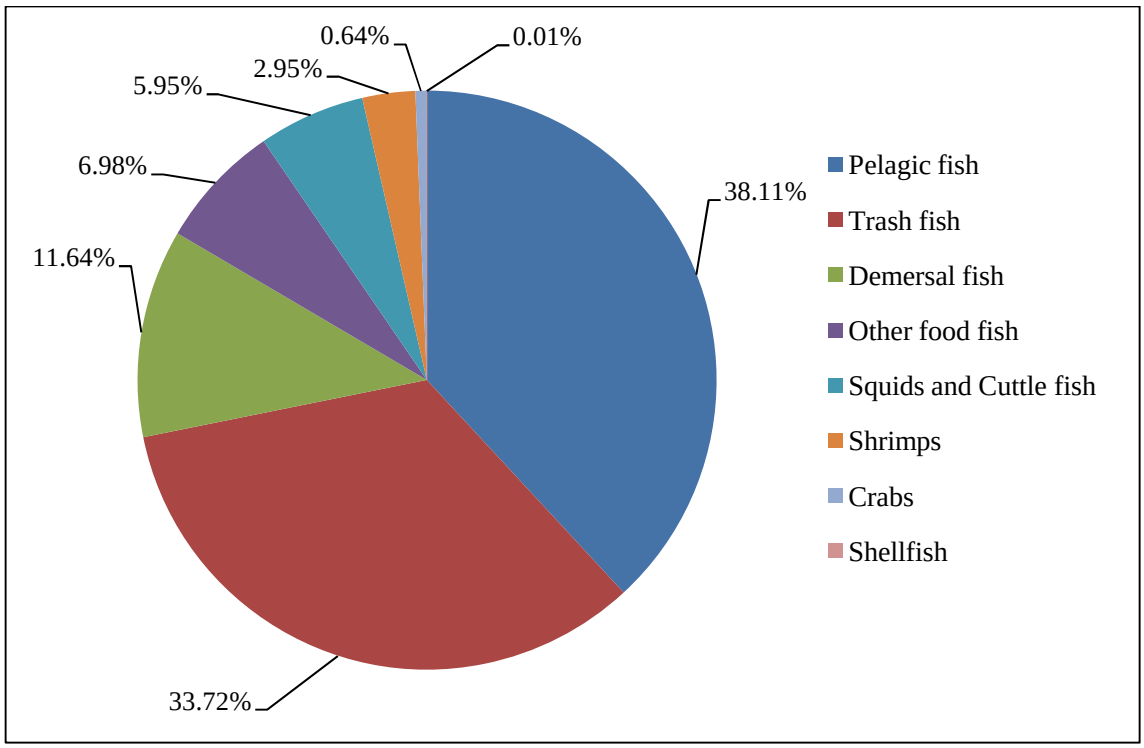

Figure 2.15: Composition of marine capture production obtained from large-scale fisheries in 2009

Source of data: Department of Fisheries, *The Marine Fisheries Statistics 2009 Based on the Sample Survey*, Technical Paper No.1/2012 (2012).

In terms of production value, pelagic fish contributes the biggest share, at about 38.82 per cent (THB13,273.1 million or USD414.8 million), of the total value generated by large-scale fisheries in Thailand.[136] It is followed by squids and cuttlefish 15.86 per cent (THB5,422.3 million or USD169.4 million), shrimps 14.90 per cent (THB5,093.3 million or USD159.2 million), and demersal fish 13.90 per cent (THB4,754.7 million or USD148.6 million) (Figure 2.16).

[136] Department of Fisheries, above n 37, 34-6.

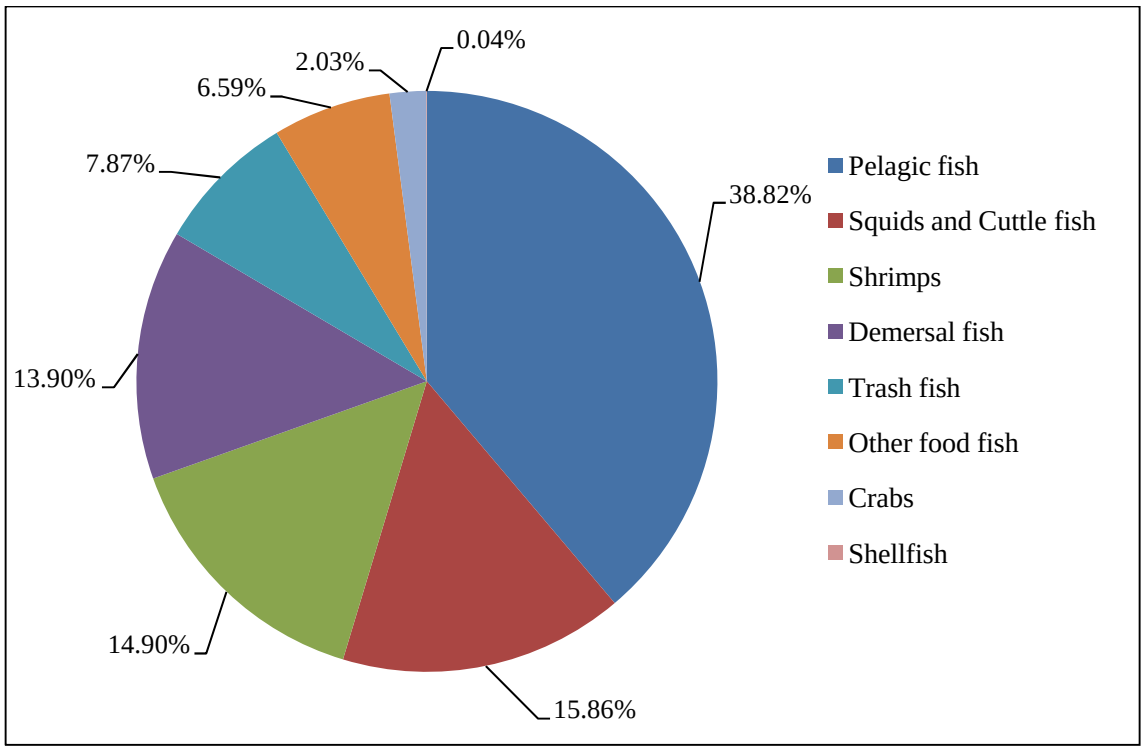

Figure 2.16: Composition of the value of marine capture production obtained from large-scale fisheries in 2009

Source of data: Department of Fisheries, *Fisheries Statistics of Thailand 2009*, Technical paper No.9/2011 (2011) 91, 34-6.

2.4 Catch Per Unit Of Effort of Marine Capture Fisheries in Thailand

According to the national fisheries statistics of Thailand, the production of marine capture fisheries has declined in the past decades (in 1990s), whereas the number of fishing vessels increased. This resulted in the decreasing trend of CPUE of marine capture fisheries in Thailand. For instance, in 1960, there were only 99 trawlers operating in Thai waters, but five years later, the number of trawlers rapidly increased to 2,392 units.[137] The enormous increase of trawlers caused the CPUE to greatly decline, from 298 kg/hr in 1961 to 179 kg/hr in 1965.[138] This phenomenon is important evidence demonstrating the overcapacity problem of marine capture fisheries in Thai waters.

[137] Marine Fisheries Research and Development Bureau, above n 54, 27.

[138] Ibid.

The Department of Fisheries has conducted marine resources surveys using five research vessels (i.e., Research Vessel No. 1, 2, 4, 9, and 12) every year,[139] covering 115,270 square kilometres of the Gulf of Thailand and 60,327 square kilometres of the Andaman Sea.[140] The surveys are aimed to monitor the status of marine fisheries resources in Thai waters. The average CPUE obtained in recent years shows a consistent declining trend of overall marine resources both in the Gulf of Thailand and the Andaman Sea (Table 2.7). For the Gulf of Thailand, the CPUE decreased from 22.369 kg/hr in 2003 to18.227 kg/hr in 2010 (18.5 per cent decreased), whereas the CPUE of the Andaman Sea reduced from 49.023 kg/hr in 2003 to 36.150 kg/hr in 2012 (26.3 per cent decreased).

Table 2.7: Catch per unit of effort (kg/hr) obtained from marine resource surveys in the Gulf of Thailand (GOT) and the Andaman Sea (AS)

Year	2003[a]		2004[a]		2005[a]		2010[b]		2011[b]		2012[c]	
Group	GOT	AS	GOT	AS	GOT	AS	GOT	AS	GOT	AS	GOT	AS
Pelagic	1.013	1.805	1.080	3.467	0.943	2.180	0.833	4.216	1.586	1.861	0.702	2.527
Demersal	6.852	21.377	8.522	22.335	6.398	25.926	6.347	23.277	9.948	26.284	5.863	26.474
Cephalopod	4.045	6.595	5.559	6.334	5.799	4.959	3.734	4.901	6.584	5.314	4.347	0.435
Shrimp	0.107	0.059	0.088	0.193	0.061	0.060	0.057	0.058	0.109	0.059	0.056	0.306
Crab	0.268	0.220	0.171	0.155	0.226	0.179	0.245	0.247	0.209	0.193	0.419	0.197
Shellfish	0.260	0.034	0.282	0.059	0.219	0.069	0.619	0.067	0.563	0.043	0.461	0.021
Others	0.239	0.111	0.142	0.083	0.174	0.068	0.109	0.076	0.119	0.967	0.096	0.467
True trash fish	9.585	18.822	9.099	15.900	10.376	18.012	6.615	10.833	5.898	6.543	6.282	5.723
Total	22.369	49.023	24.943	48.526	24.196	51.453	18.559	43.676	25.015	41.263	18.227	36.150

Source of data: [a] Kanit Chuapun et al, 'Marine Resources in the Gulf of Thailand and Andaman Sea from Research Vessel during 2002-2005' (Department of Fisheries, 2008) 9-15, 32-37; [b] Marine Fisheries Research and Development Bureau, 'Annual Report 2011' (Department of Fisheries, 2011) <http://www.fisheries.go.th/marine /FormDownload/ANNUALREPORT2011.pdf> 22-23; [c] Marine Fisheries Research and Development Bureau, 'Annual Report 2012' (Department of Fisheries, 2012) <http://www.fisheries.go.th/marine/FormDownload/ANNUAL%20REPORT%202012. pdf> 28-29.

[139] In 1963, the Department of Fisheries has commenced marine resources surveys in Thai waters by only two research vessels. However, since 1991 there have been five research vessels annually conducting the surveys.

[140] There are totally 85 survey stations covering 175,597 square kilometres, consisting of 64 stations covering 115,270 square kilometres in the Gulf of Thailand, and 21 stations covering 60,327 square kilometres in the Andaman Sea. All of research vessels use otter board trawl gear (2.5 centimetres of cod end mesh size) to operate one hour per survey station during January to June. See, Marine Fisheries Research and Development Bureau, above n 36, 21.

Additionally, the exploitation rate of marine resources in Thai waters, particularly economic species in the Gulf of Thailand, has surpassed the sustainable level (Table 2.8). This undesirable state of marine resources affirms the overcapacity issue in marine fisheries of Thailand.

Table 2.8: Estimates of exploitation ratio for economic species in the Gulf of Thailand during the period 1971-1995

Species\Year	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Atul mate	0.14	0.29	0.42	0.18	0.39	0.47	0.32	0.34	0.34	0.35	0.53	0.48
Epinephelus sexfasciatus												0.23
Loligo chinensis	0.37	0.48	0.53	0.47	0.63	0.54	0.65	0.63	0.62	0.61	0.59	0.65
Loligo duvauceli	0.26	0.35	0.4	0.34	0.5	0.41	0.52	0.5	0.49	0.48	0.46	0.53
Lutanus lineolatus	0.3	0.53	0.4	0.47	0.48	0.32	0.44	0.53	0.38	0.51	0.49	0.32
Megalaspis cordyla					0.07	0.09	0.04	0.1	0.09	0.13	0.19	0.21
Nemipterus nematophorus	0.31	0.52	0.56	0.58	0.43	0.39	0.46	0.56	0.48	0.44	0.5	0.54
Nemipterus hexodon	0.18	0.34	0.4	0.4	0.28	0.25	0.3	0.39	0.31	0.29	0.33	0.37
Nemipterus mesoprion	0.22	0.4	0.46	0.46	0.33	0.3	0.35	0.45	0.37	0.35	0.38	0.43
Nemipterus peronii	0.19	0.35	0.41	0.41	0.29	0.26	0.31	0.41	0.32	0.3	0.34	0.38
Portunus pelagicus	0.57	0.49	0.71	0.68	0.71	0.76	0.8	0.77	0.58	0.63	0.71	0.82
Priacanthus tayenus	0.19	0.47	0.35	0.2	0.43	0.3	0.46	0.33	0.15	0.23	0.2	0.26
Rastrelliger brachysoma	0.63	0.84	0.81	0.9	0.89	0.85	0.85	0.78	0.58	0.8	0.8	0.71
Rastrelliger kanagurta		0.54	0.66	0.75	0.61	0.49	0.52	0.58	0.53	0.58	0.6	0.52
Saurida elongata	0.31	0.38	0.45	0.37	0.45	0.31	0.34	0.37	0.32	0.28	0.28	0.27
Saurida undosquamis	0.31	0.38	0.46	0.37	0.46	0.31	0.34	0.37	0.33	0.28	0.28	0.27
Scolopsis taeniopterus	0.26	0.3	0.39	0.42	0.4	0.38	0.43	0.02	0.14	0.06	0.06	0.12
Scomberomorus commerson					0.62	0.71	0.78	0.75	0.67	0.68	0.82	0.69
Selar crumenopthalmus												0.09
Selaroides leptolepis	0.12	0.25	0.38	0.16	0.35	0.42	0.28	0.3	0.3	0.31	0.49	0.44
Sepia aculenta	0.41	0.5	0.59	0.46	0.58	0.56	0.64	0.64	0.61	0.64	0.66	0.83
Sepia recurvirostra	0.4	0.49	0.58	0.45	0.57	0.55	0.63	0.63	0.61	0.64	0.65	0.82
Trichiurus lepturus	0.44	0.43	0.49	0.56	0.3	0.41	0.58	0.62	0.35	0.74	0.82	0.59
Species\Year	1983	1984	1985	1986	1987	1988	1989	1991	1993	1994	1995	
Atul mate	0.44	0.48	0.54	0.52	0.55	0.72	0.73	0.74		0.93	0.83	
Epinephelus sexfasciatus	0.21	0.26	0.42	0.47	0.7	0.65	0.81	0.76	0.91	0.98	0.96	
Loligo chinensis	0.7	0.58	0.61	0.68	0.76	0.75	0.75	0.78	0.81	0.94	0.87	
Loligo duvauceli	0.57	0.45	0.48	0.56	0.65	0.64	0.64	0.67	0.73	0.92	0.79	
Lutanus lineolatus	0.33	0.17	0.35	0.44	0.49	0.46	0.68	0.81	0.91	0.92	0.86	
Megalaspis cordyla	0.17	0.03	0.08	0.19	0.23	0.32	0.39	0.31	0.64	0.98	0.39	
Nemipterus nematophorus	0.53	0.47	0.57	0.72	0.8	0.75	0.89	0.9	0.94		0.98	
Nemipterus hexodon	0.36	0.31	0.4	0.56	0.65	0.61	0.82	0.84	0.88	0.77	0.97	
Nemipterus mesoprion	0.42	0.37	0.46	0.62	0.71	0.67	0.86	0.87	0.93	0.81	0.96	
Nemipterus peronii	0.37	0.32	0.4	0.57	0.65	0.63	0.83	0.84	0.95	0.75	0.92	
Portunus pelagicus	0.79	0.79	0.78	0.76	0.87	0.81	0.8	0.83	0.78	0.69	0.85	
Priacanthus tayenus	0.24	0.24	0.21	0.31	0.5	0.52	0.61	0.63	0.82	0.81	0.95	
Rastrelliger brachysoma	0.77	0.84	0.79	0.8	0.86	0.74	0.96	0.95	0.72	0.77	0.95	
Rastrelliger kanagurta	0.61	0.49	0.5	0.57	0.62	0.81	0.9	0.92	0.75	0.95	0.94	
Saurida elongata	0.31	0.26	0.24	0.38	0.53	0.55	0.63	0.58	0.73	0.7	0.87	
Saurida undosquamis	0.32	0.27	0.24	0.38	0.53	0.56	0.64	0.59	0.72	0.79	0.89	
Scolopsis taeniopterus	0.02	0.08	0.03	0.05	0.19	0.2	0.17	0.09	0.02		0.02	
Scomberomorus commerson	0.79	0.81	0.74	0.84	0.83	0.87	0.85	0.75	0.77	0.95	0.87	
Selar crumenopthalmus	0.17	0.02		0.06	0.39	0.72	0.77	0.72	0.37	0.97	0.89	
Selaroides leptolepis	0.4	0.45	0.5	0.47	0.5	0.69	0.68	0.72		0.31	0.8	
Sepia aculenta	0.86	0.87	0.84	0.89	0.88	0.87	0.94	0.96	0.91	0.88	0.94	
Sepia recurvirostra	0.85	0.87	0.83	0.89	0.88	0.87	0.94	0.96	0.93	0.96	0.91	
Trichiurus lepturus	0.51	0.56	0.57	0.59	0.38	0.83	0.79	0.73	0.65	0.96	0.95	

Source of table: Amnuay Kongprom et al, 'Status of Demersal Fishery Resources in the Gulf of Thailand' in Geronimo T Silvestre et al (eds), Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries (WorldFish Center, 2003) vol 67, 146.

2.5 Legislative Framework for Fishing Vessels Registration and Fishing Gears Licensing in Thailand

In order to operate fishing in Thai waters, there is a legal requirement for fishing vessels to be registered and fishing gears to be licensed. The details concerning fishing vessel registration and fishing gear licensing are presented in the following sections.

2.5.1 Fishing Vessels Registration

In Thailand, the *Thai Vessels Act B.E. 2481 (1938)* which was enacted on 7 April B.E. 2482 (1939) and came into force since 7 October B.E. 2482 (1939),[141] is the principal law governing all vessels or any kinds of water vehicles[142] and administered by the Ministry of Transport. This Act consists of nine chapters,[143] containing 70 sections. It has been amended several times including in B.E. 2517 (1974),[144] B.E. 2521 (1978),[145] B.E. 2528 (1985),[146] B.E. 2534 (1991),[147] and B.E. 2540 (1997).[148] Based on this Act,

[141] The *Thai Vessels Act B.E. 2481 (1938)* came into force after the expiration of 180 days from 10 April B.E. 2482 (1939), which was the date of its publication in the Government Gazette (2482/-/230).

[142] The *Thai Vessels Act B.E. 2481 (1938)* section 5(3).

[143] Those nine chapters include Chapter 1: Registration of Thai Vessels; Chapter 2: Certificate of Registration of Thai Vessels; Chapter 3: Transfer of Ownership of the Registered Thai Vessels; Chapter 4: Mortgage and Preferential Rights respecting to Registered Thai Vessels; Chapter 5: Names of Vessels, Modification of Vessels, Change in Registration Ports, Registration, Amendment and New Registration of Vessels; Chapter 6: Privileges and Duties of Thai Vessels; Chapter 7: Miscellaneous Provisions; Chapter 8: Penalty Provisions; and Chapter 9: Transitory Provisions. See, The *Thai Vessels Act B.E. 2481 (1938)*.

[144] After using the fee rates prescribed in the *Thai Vessels Act B.E. 2481 (1938)* for more than 34 years, those fees were needed to be increased in order to suit the fisheries that have much developed, particularly large scale fisheries. Therefore, the *Thai Vessels Act B.E. 2517 (1974)* was enacted. It was published in Government Gazette (2517/77/1p.) on 1 May B.E. 2517 (1974).

[145] The *Thai Vessels Act B.E. 2521 (1978)* was enacted in order to amend the provisions with respect to the qualification of the owner of registered Thai boats, the temporary registration of Thai boats in foreign countries, and the fee rates. This Act was published in Government Gazette (2521/156/27p.) on 31 December B.E. 2521 (1974).

[146] The *Thai Vessels Act B.E. 2528 (1985)* was enacted for the purpose to decrease the portion of Thai partnerships in registered Thai fishing boat company in order to attract foreign investors. This Act was published in Government Gazette (2528/154/8p.) on 24 October B.E. 2528 (1985).

[147] The *Thai Vessels Act B.E. 2534 (1991)* was enacted for the purpose to add some provisions with regard to the penalties applied when violating Section 7 and 7 bis. This Act was published in Government Gazette (2534/211/1p.) on 4 December B.E. 2534 (1991).

Thai vessels must be registered with the vessel registrar.[149] Additionally, in order to be registered as a Thai vessel, a vessel must hold an inspection certificate to certify that it has already been inspected by the inspection officer of the Marine Department according to the *Navigation in Thai Waters Act B.E. 2456 (1913).*[150] Such certificate must be presented to the Vessel Registrar.[151]

Upon registration under the *Thai Vessels Act B.E. 2481 (1938),* the vessels for trading purposes in Thai waters, which shall be deemed a Thai vessel, include: (1) a powered vessel of 10 GT or greater; (2) a sea vessel[152] of 20 GT or greater, which is not a powered vessel; and (3) a river vessel[153] of 50 GT or greater, which is not a powered vessel. For fisheries purposes,[154] on the other hand, a powered vessel of every size and a non-powered vessel of six GT or greater are required to be registered.[155] This means that the non-powered vessels that are employed in Thai fisheries and smaller than six GT, are not obliged to be registered and they, therefore, are excluded from Thai fishing vessels statistics.[156]

To apply for a registration, the applicant will follow the rules below:

> '(1) To submit a statement manifesting an ownership in the printed form of the Marine Department;
>
> (2) To make a statement certifying that the conditions for being an owner of the vessel shall be in accordance with Section 7 and to produce the evidence thereof. If the applicant is a partnership or a limited company, the certificate of registration of such entity shall be produced;

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[148] The *Thai Vessels Act B.E. 2540 (1997)* was enacted in order to improve the provisions with respect to the qualification of the owner of registered Thai boats, which was amended by the *Thai Vessels Act B.E. 2528 (1985).* The *Thai Vessels Act B.E. 2540 (1997)* was published in Government Gazette (2540/53k/1) on 7 October B.E. 2540 (1997).

[149] The *Thai Vessels Act B.E. 2481 (1938)* section 6.

[150] The Navigation in Thai Waters Act B.E. 2456 (1913) was enacted in 1913 in the period of King Rama VI, the sixth King of Chakri Dynasty. At that period Thailand was named 'Siam' and was governed by Monarchy. Thus, the original name of the Act was 'The Navigation in Siam Waters B.E. 2456'. This Act came into effect on 1 September 1913. See, *The Navigation in Thai Waters Act B.E. 2456 (1913).*

[151] The *Thai Vessels Act B.E. 2481 (1938)* section 12.

[152] A sea vessel refers to a vessel having the structure for sea sailing. See, The *Thai Vessels Act B.E. 2481 (1938)* section 5(5).

[153] A river vessel refers to a vessel other than a sea vessel. See, The *Thai Vessels Act B.E. 2481 (1938)* section 5(6).

[154] Fisheries mean fishing of any kinds of aquatic animals by either using a vessel or using a vessel as a vehicle for fishing. See, The *Thai Vessels Act B.E. 2481 (1938)* section 5(8).

[155] The *Thai Vessels Act B.E. 2481 (1938)* section 8.

[156] Thai fishing vessels statistics are yearly published by the Department of Fisheries, Thailand.

(3) To submit the inspection certificate of the vessel issued by the inspection officer of the Marine Department;[157]

(4) To submit a statement showing the date and place where the construction of the vessel is completed as it is possible;

(5) If the vessel is used to belong to a foreigner, the previous name of the vessel shall also be stated;

(6) To state the name of the vessel controllers.'[158]

In terms of the certificate of registration for Thai vessels, Section 14 of this Act states that it will be in a printed form of the Marine Department, and will indicate the following information:

'(1) Names of the vessel,[159] port where the vessel is registered, and the vessel controllers;

(2) Type of the vessel, names of the shipyard where the vessel was constructed and also the shipyard owner;

(3) Details of the inspection of the vessel;

(4) Details regarding the acquisition of vessel ownership as shown in the statement thereof;

(5) Names, addresses and occupations of the person registered as the owner of the vessel. In case the owner is partnership or limited company, the names and address of the managing director or the directors are required.'[160]

In addition, 'if a vessel has been registered as a Thai vessel at any port, such port will be a registration port of the vessel.'[161] When the vessel registration has already been made, the vessel registrar will issue the certificate of registration of such vessel in a printed form of the Marine Department. This certificate is called the 'registration certificate',[162] and the vessel controller must keep it with the vessel at all times unless complying with this Act or other laws.[163] Upon a request of the inspection officer, the vessel controller must present the registration certificate to him/her immediately.[164] If such certificate has

[157] As required under Section 12 of the *Thai Vessels Act B.E. 2481 (1938).*

[158] The *Thai Vessels Act B.E. 2481 (1938)* section 10.

[159] A registered Thai vessel must not carry other name than that already been registered. The registered name of the vessel can be changed only with the permission of the Director General of the Marine Department. The change of a vessel name must be made in accordance with the provisions under the Ministerial Regulation. See, *The Thai Vessels Act B.E. 2481 (1938)* section 38.

[160] The *Thai Vessels Act B.E. 2481 (1938)* section 14.

[161] The *Thai Vessels Act B.E. 2481 (1938)* section 15.

[162] The *Thai Vessels Act B.E. 2481 (1938)* section 16.

[163] The *Thai Vessels Act B.E. 2481 (1938)* section 17.

[164] The *Thai Vessels Act B.E. 2481 (1938)* section 17.

lost or substantially damaged by any reasons, the vessel controller must apply for the new certificate for replacement from the vessel registrar at the registration port. If such incident happens outside the registration port, the vessel controller must therefore apply for the temporary certificate at the next arrival port where having a vessel registrar or Thai consulate, as the case may be. Later, when the vessel arrives the registration port, the vessel controller must bring the temporary certificate to the vessel registrar of the port within 10 days from the date of arrival in order to get a new certificate.[165]

In terms of transferring the ownership of a registered Thai vessel by act in the law, the transfer shall be conducted by submitting an application to the vessel registrar or a Thai consulate official of the registration port for stating such transfer in the registration book. If the transfer has already been conducted outside the registration port, a vessel registrar or a Thai consulate official of the port, where the transfer has been conducted, will perform as the vessel registrar of the registration port, and state such transfer in the registration certificate, as well as urgently send the copy of the ownership transfer agreement with its certified translation, if necessary, to the vessel registrar of the registration port. After receiving these documents, the vessel registrar will state such transfer detail in the registration book.[166]

As described above, it can be seen that the *Thai Vessels Act B.E. 2481 (1938)* does not require all types of vessels in Thailand to be registered, particularly the non-motorised fishing boats that are smaller than six GT. This presents an obstacle in obtaining the actual number of fishing vessels, especially small-scale fishing vessels that locate in fishing villages of coastal provinces in Thailand. Furthermore, the process in applying for vessel registration is quite complicated and takes a long time to be done, and then it might not convenient for applicants. Therefore, some owners might hesitate to register their fishing vessels because of such inconveniences that may occur. Besides, the penalties prescribed in this Act are not reasonable with the present state of Thailand's economy, particularly in marine fisheries sector, which have been greatly developed since this Act was enacted. To specify this issue, for instance, the fine applied when violating the provision of Section 17, which states that based on the request of the

[165] The *Thai Vessels Act B.E. 2481 (1938)* section 18.

[166] The *Thai Vessels Act B.E. 2481 (1938)* section 27.

inspection officer, the vessel controller must present the registration certificate to him/her immediately, is just not more than THB200 (USD6.25). Since this very small amount of fine can be easily afforded by the owners of fishing vessels, having the vessels registered with currently complicated process in order to get the registration certificate could be intentionally ignored by the vessel owners.

In order to solve the issues addressed above, the Thai Cabinet has submitted a new draft of the Thai Vessels Act to the National Assembly[167] to consider on 7 August 2008. Under this Thai Vessels Bill, it requires all vessels in Thailand, other than non-motorized boats smaller than 1.5 GT, to be registered.[168] With respect to vessel registration, this Bill suggests that it will be in line with the provisions under the Ministerial Regulation, which has more flexibility in changing if needed.[169] Moreover, this Bill increases the prescribed fine for violating many provisions, such as the prescribed fine for violating Section 17, which will be increased from not more than THB200 to not more than THB20,000 (USD6.25 to USD625).[170] At current stage, this Bill is still under consideration of the National Assembly. This process has taken a very long time due to the changes of Thai government in the past years.

2.5.2 Fishing Gears Licensing

The former *Fisheries Act B.E. 2490 (1947),*[171] amended in B.E. 2496 (1953) and B.E. 2528 (1985), was the principal fisheries law of Thailand until it was repealed by the

[167] The National Assembly of Thailand is a bicameral legislature composed of a Senate (150 members) and a House of Representatives (HOR, 500 members). The Senate is non-partisan, sitting in 6-year term. 77 Senators are elected, one of each province. The other 73 senators are selected from candidates nominated by the Senator Selective Committee. For the HOR, who sits in 4-year term, 375 members are directly elected by people who have the right to vote based on the national census. The other 125 members come from the election on a party-list, represented by different political parties in accordance with the proportional representation through a popular vote that each party receives. See, Senate of Thailand, *The National Assembly under the Constitution of the Kingdom of Thailand B.E. 2550 (2007)* (26 February 2015) <http://thai.senate.go.th/in/english/national_assembly_1.php>.

[168] The *Thai Vessels Bill B.E. 2551 (2008)* section 8.

[169] The *Thai Vessels Bill B.E. 2551 (2008)* section 10.

[170] The *Thai Vessels Bill B.E. 2551 (2008)* section 63.

[171] The *Fisheries Act B.E. 2490 (1947)* is not the first fisheries law of Thailand. The first fisheries law of Thailand is the *Fisheries Act* enacted in B.E. 2444 (1901) and used for 46 years before being repealed and replaced by the 1947 fisheries law. At that period, marine fisheries in Thailand had not been developed. Fishers mainly used basic traditional fishing gears to catch freshwater fish. Within the first fisheries law, the stated fisheries management measure were, therefore, closing fishing areas due to spawning season of freshwater fish. However, the main objective of the *Fisheries Act B.E. 2444 (1901)* was to collect fishery

new *Fisheries Act B.E. 2558 (2015)*.[172] The *Fisheries Act* was administered by the Ministry of Agriculture and Cooperatives. It consisted of 6 chapters, with 73 sections in total. Those chapters included 'Chapter 1 Fisheries; Chapter 2 Cultivation Pond; Chapter 3 Registration and Application for Permission; Chapter 4 Fisheries Statistics, and Chapter 6: Control, and Penalties.' The provisions concerning fishing vessels and fishing gears were stated under Chapter of Registration and Application for Permission of this Act.[173]

Chapter 3 contained the requirement for persons who engaged in fisheries sectors that were indicated in the Royal Decree to be registered, and also required those persons to apply for a permit and pay fee before engaging in such occupation.[174] For example, the person who wanted to conduct fishing career had to pay THB5 (USD0.16) for the annual fee.[175] The period of validity of the license was one year.[176] Fishing gears used in Thailand were categorised into two groups, fishing license implement and non-fishing license implement. The former group was required for registration,[177] and the fishers who used these fishing gears, were obliged to pay the fishery tax.[178] On the other hand,

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tax from fishers. See, Choomjet Karnjanakesorn and Somboon Yen-Eng, 'Revision to Thai Fisheries Law and Opportunities for Community-based Management' in Donna J Nickerson (ed), *Community-based Fisheries Management in Phang-nga Bay, Thailand. Proceedings of the National Workshop on Community-based Fisheries Management Organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996* (FAO, 1998) vol RAP Publication 1998/3, BOBP Report No.78, 159.

[172] The new Fisheries Act of Thailand will come into force later in 2015. See, Legal Affairs Divisions, *The New Fisheries Act* (15 January 2015) <http://www.thaianti-humantraffickingaction.org/Home/?p=457>.

[173] The *Fisheries Act B.E. 2490 (1947)* chapter 3.

[174] Section 25 of the *Fisheries Act B.E. 2490 (1947)* states that 'The Minister shall have power to issue a notification requiring person in any locality who engage in fishing, trading in aquatic animals, fishery products or fishery industry as may be specified in the Royal Decree to be registered, and requiring them to apply to the competent official for permission before engaging in such occupation with or without the license fee being charge under this Act'. The 'Minister' means the Minister taking charge and control of the execution of this Act, which currently means the Minister of Ministry of Agriculture and Cooperatives. See, the *Fisheries Act B.E. 2490 (1947)* section 4(18); for the 'competent official', this means the Provincial Governor, Nai Amphor (district officer), fishery officers or person appointed by the Minister to carry out this Act. See, the *Fisheries Act B.E. 2490 (1947)* section 4(16).

[175] The Ministerial Regulation No. 17 B.E. 2521 (1978) appendix table No. 4.

[176] 'The period of validity of a license shall, for the purpose of applying for permission and paying fishery tax, commence from the 1st April to the 31st March'. See, the *Fisheries Act B.E. 2490 (1947)* section 43.

[177] The *Fisheries Act B.E. 2490 (1947)*. Section 26 indicates that 'The Minister shall have the power to issue a notification requiring owners or possessors of any kind of fishing appliance in any locality to have the fishing appliance in their possession registered with the competent official'.

[178] The *Fisheries Act B.E. 2490 (1947)*. Section 28 states that 'Any person in entitled to use licensed fishing appliance only when the license specifying his name has been issued and the fishery tax under this Act has been paid. The Minister is empowered to issue a notification exempting the requirement of license of any kind of fishing appliance in any locality'.

the latter group, e.g., hook and line, traps, spears, was not required to be registered, so that the fishers using these gears were not obliged to pay fishery tax.[179] The list of fishing gears needed to be registered, as well as their prescribed fishery tax, were specified in the *Ministerial Regulation No. 1 B.E.* 2490 (1947).[180] The list had been revised in the *Ministerial Regulation No. 17 B.E.* 2521 (1978)[181] due to the fact that the old rates of fishery tax were not reasonable to the income obtained from marine fisheries by using those fishing gears at that time. Besides, for the fishers who used stationary fishing gears, such as lift nets, set bag nets, they were required to pay additional tax for the areas where such gears were installed. This tax ranged between THB10-200 (USD0.31-6.25) per unit.[182] However, considering the current income of fishers now, such amended rates of fishery tax were still very low.

Based on the *Fisheries Act*, each particular fishing license could be used only by the entitled person. Furthermore, the fishers were required to carry the fishing permit and license while operating and would present it for inspection based on the request of the competent authority.[183] If any fishers violated this Act or the restrictions prescribed in the fishing license or permit, or did not pay the fishery tax, the competent authority could withdraw such fishing license or permit.[184]

Additionally, Section 32 of this Act empowered the Minister or Provincial Governor in his jurisdiction to promulgate a Notification, which determined the elements including: (i) mesh sizes and dimension of all types of fishing gears, as well as sizes, types, number and components of fishing gears that were allowed to use;[185] (ii) types of fishing gears that were strictly banned in fisheries;[186] (iii) specified methods of using all

[179] Karnjanakesorn and Yen-Eng, above n 171, 163.

[180] The Minister of the Ministry of Agriculture Administration (changed to the Ministry of Agriculture and Cooperatives on 1 October B.E. 2505 (1962)) issued the Ministerial Regulation No. 1 B.E. 2490 (1947) on 14 April B.E. 2490 (1947) based on the power given in Section 4(13) and Section 5 of the *Fisheries Act B.E. 2490 (1947).*

[181] The Ministerial Regulation No. 17 B.E. 2521 (1978) was issued by the Minister of the Ministry of Agriculture and Cooperatives on 6 July B.E. 2521 (1978).

[182] The Ministerial Regulation No. 17 B.E. 2521 (1978) appendix table No. 1.

[183] The *Fisheries Act B.E. 2490 (1947)* section 35.

[184] The *Fisheries Act B.E. 2490 (1947)* section 36.

[185] The *Fisheries Act B.E. 2490 (1947)* section 32(1).

[186] The *Fisheries Act B.E. 2490 (1947)* section 32(2).

types of fishing gears;[187] (iv) specified spawning and breeding seasons, and fishing gears and practices that were allowed to use during these seasons;[188] and (v) types, sizes and maximum amount of aquatic animals that were allowed to take.[189] Thus, based on the *Fisheries Act B.E. 2490 (1947),* these provisions played the main role in managing fishing capacity in Thailand.

Nonetheless, as this Act was an outdated law, some provisions were then impractical for current status of Thai fisheries, particularly the fine penalties.[190] For example, the penalty imposed for person who violated the provisions in Section 32, was fines from THB5,000 to THB10,000 (USD156.25 to 312.5), whereas the average net profit obtained from marine fisheries in Thailand is between THB36,965 to 464,033 per month per vessel (USD1,155.16 to 14,501.03 per month per vessel).[191] Clearly, these fines are considered very small amounts of money compared with the fishers' present income from marine fisheries. Therefore, some fishers may not hesitate to take a risk by not complying with this law in order to catch fish as much as they can, for instance, by using the net that has smaller mesh size than is required by law. Moreover, although the fishery tax or fishery fee is considered as a small amount of money, some fishers still neglect to either apply for fishing gear license or be registered. It could also be because the complied fines are easily affordable,[192] so that those fishers may not take it seriously. This results in difficulties to obtain the actual numbers of fishers, fishing gears and fishing vessels that are operating in Thai fisheries.

Many enforcement problems have also surfaced, particularly the use of new destructive fishing gears and fishing methods, which are modified to take advantage of the loopholes in fisheries regulations. In addition, since there is no fishing zones legally

[187] The *Fisheries Act B.E. 2490 (1947)* section 32(4).

[188] The *Fisheries Act B.E. 2490 (1947)* section 32(5).

[189] The *Fisheries Act B.E. 2490 (1947)* section 32(6).

[190] The *Fisheries Act B.E. 2490 (1947)* chapter 6.

[191] The average net profit obtained by Thai fishing vessel sized 20 to 50, 50 to 100, 100 to 500 GT is 36,965, 45,032 and 464,033 THB/month/vessel, respectively. See, Lymer et al, above n 28, 28.

[192] Section 63 of the *Fisheries Act B.E. 2490 (1947)* states that 'Any person who fails to comply with the Notification of the Minister issued under Section 25 or 26 shall be liable to a fine not exceeding one hundred THB (USD3.13) or to imprisonment not exceeding one month, or to both'. Besides, Section 64 states that 'Any person who uses the fishing appliance without licence required by this Act under Section 28, of fails to pay additional fishery tax under Section 23, shall be liable to a fine of three times the amount of the tax…'.

arranged in Thai waters,[193] hence fisheries management measures, for controlling fishing capacity in particular, cannot be implemented appropriately. As a consequence, the problem of fishing overcapacity in Thailand has remained.

To respond to the issues addressed above, the Department of Fisheries, with the assistance from FAO in 1999, prepared a first draft of the new Fisheries Act that was hoped to solve such problems. The draft was reviewed by stakeholders several times and eventually submitted to the Cabinet for consideration. However, because of the instabilities of the Thai Cabinet and draft revisions required by each Cabinet, the draft of the new Fisheries Act could not be approved in principle by the Cabinet until 12 June 2007. Such draft was then sent to the Council of State of Thailand[194] to be examined in detail. After amendment based on the comments given by the Council of State of Thailand, the Fisheries Bill was approved and returned to the Cabinet on 9 February 2010.[195] The same Fisheries Bill was submitted to the National Assembly by the Cabinet for urgent consideration of enactment on 13 May 2012.[196] Finally, it has been approved by the National Legislation Assembly on 9 January 2015, and will come into effect as from 60 days after its publication date in the Government Gazette.[197] The succeeding discussions of the thesis will therefore refer to provisions under this new *Fisheries Act* as they are provisions under the *Fisheries Act B.E. 2558 (2015)*.

The *Fisheries Act B.E. 2558 (2015)* consists of 11 chapters with 101 sections. The 11 chapters include Chapter 1 Fisheries Management; Chapter 2 Fishing Zones; Chapter 3 Promotion of Aquaculture; Chapter 4 Food Safety of Fish or Fisheries Products; Chapter 5 Import and Export Fish or Fisheries Products; Chapter 6 Overseas Fisheries;

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[193] At present, in terms of the types of fishing areas, Thai fisheries are categorised into four groups, i.e., (i) preservation fisheries, (ii) leasable fisheries, (iii) reserved fisheries, and (iv) public fisheries. See, the *Fisheries Act B.E. 2490 (1947)* section 6. For public fisheries, everybody has its right to fish and conduct aquaculture of aquatic animals by complying with the restrictions issued by the Minister of Ministry of Agriculture and Cooperatives and published in the Government Gazette. See, the *Fisheries Act B.E. 2490 (1947)* section 16.

[194] The Council of State of Thailand is governmental legal institution performing both consultative and adjudicatory functions. See, The Council of State of Thailand, *Background* <http://www.krisdika.go.th/wps/portal/general/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3g_A2czQ0cTQ89ApyAnA0__EIOAQGdXAwMLE30_j_zcVP2CbEdFAIfszEk!/dl3/d3/L3dDb0EvUU5RTGtBISEvWUZSdndBISEvNl9OMEM2MUE0MUlRQlJCMElPVDBQUUNFMDBOMw!!/>.

[195] Department of Fisheries, *Background of the Fisheries Bill* (2010) <http://www.fisheries.go.th/management/weblaws/r_pamong6.pdf>.

[196] Within this thesis, it is called the *Fisheries Bill B.E. 2555 (2012)*.

[197] Legal Affairs Divisions, above n 172.

Chapter 7 Fees of Fisheries Permits; Chapter 8 Transfer of Fisheries Permits; Chapter 9 Government Authorities; Chapter 10 Administrative Measures, and Chapter 11 Penalties. There are a number of notably revisions under this new Act, including provisions aimed to reform fisheries management scheme and promote public participation.

In order to improve fisheries management of Thailand, this new *Fisheries Act* categorises fishing areas into three zones, i.e., 'coastal fisheries zone', 'offshore fisheries zone', and 'freshwater fisheries zone'.[198] 'Coastal fisheries zone', which is basically designated for small-scale fisheries,[199] covers the sea areas extending to three nautical miles from the shoreline and to a limit not greater than 12 nautical miles from the shoreline according to the authority of the Minister.[200] The 'offshore fisheries zone' is mainly designated for large-scale fisheries[201] and covers areas next to the 'coastal fisheries zone' and extends to the outermost limit of Thailand's EEZ.[202] Freshwater fisheries zone exclude the coastal and offshore fisheries zones,[203] meaning inland waters within land boundaries.[204] One of the main purposes of the designation of fishing zones is to determine the allowable catches (in terms of species and sizes of fish caught, maximum amount of catch),[205] as well as to specify fishing gears and practices allowed and not allowed to be used (in terms of types, number, size of fishing gears)[206] in a particular fishing zone.[207] The fishers are also required to pay reasonable fishery tax in order to obtain such fishing licenses.[208] These provisions are aimed to put in place an effective legal framework to control fishing capacity in Thai fisheries.

With regard to public participation, the new *Act* encourages public participation in both national and provincial levels. In terms of the national level, the *Act* requires the

[198] The *Fisheries Act B.E. 2558 (2015)* section 37.
[199] Legal Affairs Divisions, above n 172.
[200] The *Fisheries Act B.E. 2558 (2015)* section 38.
[201] Legal Affairs Divisions, above n 172.
[202] The *Fisheries Act B.E. 2558 (2015)* section 39.
[203] The *Fisheries Act B.E. 2558 (2015)* section 40.
[204] Legal Affairs Divisions, above n 172.
[205] The *Fisheries Act B.E. 2558 (2015)* section 6(3).
[206] The *Fisheries Act B.E. 2558 (2015)* section 6(1).
[207] The *Fisheries Act B.E. 2558 (2015)* section 41-2.
[208] The *Fisheries Act B.E. 2558 (2015)* section 43.

establishment of the National Fisheries Policy Committee (consisting of both government and private sectors), whose mandate is to develop national policies with respect to capture fisheries within and beyond Thai waters, aquaculture, and relevant fisheries industries, as well as to propose such policies to the Cabinet to consider for implementation.[209] For fisheries in Thai waters in particular, the National Fisheries Policy Committee is required to issue the fisheries development policy that supports the sustainable management of fisheries resources and capacity. Furthermore, the Committee is mandated to determine the maximum allowable catch within Thai waters.[210] This requirement has been stated in Thai fisheries law for the first time.[211] Clearly, these provisions under the new *Fisheries Act* provide the legal framework that supports Thailand to better manage its capacity in fisheries. At the provincial level, the *Act* encourages local fisheries communities to actively participate in managing fisheries resources, so that the government authorities will be able to implement the appropriate management measures that serve the actual needs of local stakeholders and, therefore, to achieve the effective results. To serve this purpose, the Provincial Fisheries Committee (also consisting of both government and local private sectors) has been established in each province. This Provincial Fisheries Committee has a mandate to propose policy or management and conservation measures that are in line with the state of fisheries resources and capacity in its competent areas to the National Fisheries Policy Committee and the Minister to consider.[212] In this sense, the new *Fisheries Act* has also followed the current *Constitution of Thailand* promulgated in 2007, which strongly encourages the public to actively and appropriately participate in the activities concerning preservation, conservation and utilisation of natural resources and biological diversity.[213]

In terms of penalties, the new *Fisheries Act* substantially increases both prison sentence and fines. For instance, the fine imposed for violation of Section 32 under the *Fisheries Act B.E. 2490 (1947)* is only THB5,000 to 10,000 (USD156.25 to 312.5), whereas the

[209] The *Fisheries Act B.E. 2558 (2015)* section 16.

[210] The *Fisheries Act B.E. 2558 (2015)* section 16(6).

[211] This provision follows the *LOSC* art 61(1).

[212] The *Fisheries Act B.E. 2558 (2015)* section 20(1)(2).

[213] *The Constitution of the Kingdom of Thailand B.E. 2550 (2007)* part 8, section 85(4).

fine imposed for the violation of Section 6 under the *Fisheries Act B.E. 2558 (2015)*[214] is greatly increased to THB10,000 to 100,000 (USD312.5 to 3,125). The increased fine is one of the attempts to make the new *Fisheries Act* more effectively implemented for present fisheries of Thailand.

However, as the *Fisheries Act B.E. 2558 (2015)* is a very new fundamental fisheries law and needs a number of supplementary Notifications or regulations issued by the Minister of Ministry of Agriculture and Cooperatives or the Governor of provinces to support its implementation, several Notifications and regulations that have been issued and applied to support the *Thai Fisheries Act B.E. 2490 (1947)* are therefore still in use. Such Notifications, concerning fishing capacity management in particular, are later discussed in Chapters 4 and 5.

2.6 The Master Plan for Marine Fisheries of Thailand

Apart from the fisheries laws that are used to govern marine fisheries in Thailand, the government of Thailand has also established a particular framework to specially manage marine fisheries, including their fishing capacity.

The Department of Fisheries has been well aware that the depleted marine resources in Thai waters are the consequences of overcapacity in marine fisheries and the lack of the effective marine fisheries management. In order to solve these core problems in Thai fisheries, the Department of Fisheries appointed the Master Plan Formulation Committee and the four groups of Sub-committee, i.e., Small-scale Fisheries Sub-committee, Commercial Fisheries Sub-committee, Distant Water Fisheries Sub-committee, and Information for the Formulation Sub-committee, to develop the *Master Plan for Marine Fisheries Management of Thailand* in 2006.[215] During the process of the Master Plan formulation, the brainstorming meetings among the representatives of stakeholders in fisheries were also arranged in order to supplement the inputs into the Master Plan first draft. Subsequently, that draft was proposed in public hearing

[214] Section 32 of the *Fisheries Act B.E. 2490 (1947)* and Section 6 of the *Fisheries Act B.E. 2558 (2015)* are quite similar in details.

[215] The *Master Plan for Marine Fisheries Management of Thailand*, hereinafter referred to as the Master Plan.

meetings participated by fisher representatives from 23 coastal provinces for further inputs. Later, the final draft of the Master Plan was submitted to the Cabinet for approval on 7 July 2008 and eventually approved in April 2009.[216]

The Master Plan has been implemented since 2009 for a period of 10 years. This time frame is split into two five-year periods. The first period is from 2009-2013, while the second period is from 2014-2018. The objectives of the Master Plan include: i) to manage marine fisheries in a responsible and sustainable manner; ii) to rehabilitate the depleted fish stocks and damaged ecosystem; iii) to develop the efficiency of fisheries organisations and support the co-management, as well as establish the cooperation network among stakeholders in terms of marine fisheries management; iv) to strengthen the capability of fishery enterprises at all levels in order to support them to effectively operate under present fishery situations and regulations; v) to enhance the quality of life of fishers; and vi) to ensure food security and food safety of fish and fisheries products.[217]

The Master Plan has set three targets, including: i) the sustainability of Thai marine fisheries is secured, and it is capable to maintain the annual landing of marine fish at the level of 1.7-2.0 million tonnes, consisting of at least 80 per cent of important economic species, obtained from the fishing grounds within the national EEZ, and 1.0-1.6 million tonnes obtained from distant water fisheries; ii) there is at least one fishers' organisation established in each province, and it actively participates in marine fisheries management with government agencies. It also creates a network with other organisations in adjacent areas; and iii) at least 10 per cent of total coastal fishing communities participate in community-based fisheries management.[218]

To achieve the successful outcome of aforementioned objectives and targets, the Master Plan establishes five strategies to cover the components of marine fisheries management, i.e., (i) effectively improving the system of marine fisheries management and the co-management; (ii) strengthening structure and capability of fisheries organisations; (iii) developing and promoting responsible and sustainable utilisation of

[216] Department of Fisheries, above n 66.

[217] Ibid.

[218] Ibid.

marine fisheries resources; (iv) rehabilitating marine ecosystem and fishing grounds in order to safeguard biodiversity and marine environmental quality; and (v) promoting and developing distant water fisheries.[219] Each strategy also provides measures and guidelines related to fishing capacity management in Thai fisheries. The first strategy, which concerns the effective improvement of marine fisheries management system and the co-management, has as one of its goals is to manage fishing capacity at the commensurate level with the current conditions of fish stocks. With the strategy, the guidelines and responsible bodies are suggested. The first guideline is to improve the effectiveness of granting and renewing the fishing licenses, and impose a reasonable fee for the resource rent. The responsible bodies of this task are the Department of Fisheries and the Ministry of Transport. Secondly, the Department of Fisheries also needs to define the number of fishing vessels and fishing gears, which are suitable for the size of sustainable fish stocks. Furthermore, the Department of Fisheries together with the Ministry of Transport should cooperate in reducing the number of fishing vessels, and controlling the construction of new fishing vessels. Additionally, all relevant agencies should develop and implement pilot projects that promote the alternative careers with initial supports for fishers. These agencies include the Department of Fisheries, the Fisheries Association of Thailand, the Ministry of Interior, the Ministry of Commerce, the Ministry of Education, the Ministry of Labour, the Ministry of Social Development and Human Security, and the Southeast Asian Fisheries Development Center (SEAFDEC).[220]

In addition, under the third strategy, the Master Plan provides the guidelines for development and promotion of fishing gears and fishing practices for sustainable fisheries, that the Department of Fisheries should specify types and sizes of fishing gears and practices that are allowed to use, and also promote research studies and improvement of fishing gears that are friendly with ecosystem and environment. Moreover, the Department of Fisheries and SEAFDEC should provide support, training and knowledge to stakeholders, particularly fishers, with regard to the use of fishing gears, equipments, and practices that ensure the sustainable fisheries. Additionally, this strategy includes the measures to control illegal fishing and destructive fishing practices

[219] Ibid.

[220] Ibid.

that are harmful to marine resources and environment. The guidelines given for such measures are to recognise and promote the use of fishing gears and ancillary equipment as stated by law, which is under the responsibility of the Department of Fisheries. The Department of Fisheries, the Fish Market Organisation, and the Ministry of Commerce are also required to cooperate in controlling the marketing of illegal catch. Particularly, the Department of Fisheries shall effectively improve laws and regulations needed to control the possession of certain types and sizes of some species, and protect the trade of fish obtained from illegal fishing. The legislation, which supports the use of fishing practices that enhance the reduction of bycatch[221] and trash fish, and strengthens the punishment for fisheries law violation in order to promote its compliance, is also required. Lastly, it is needed to improve MCS measures, including the measures of Port State control and vessel monitoring system (VMS) installation, with the active participation of local governments and fishers' organisations. These measures require the cooperation from many agencies to support, including the Department of Fisheries, the Fish Market Organisation, the Ministry of Foreign Affairs, the Ministry of Finance, the Ministry of Transport, the Royal Thai Navy, and the Royal Thai Police.[222]

In the fourth strategy concerning marine ecosystem and fishing ground rehabilitation to safeguard biodiversity and marine environmental quality, one of the measures needed is to promote closed areas and closed seasons for marine resource conservation with the participation of fisheries communities and fishers' organisations. The Master Plan suggests the Department of Fisheries and the Ministry of Natural Resources and Environment to corporately determine the conservation and protection measures for particular species by banning the use of certain fishing gears or practices during certain periods of year.[223]

The aforesaid strategies are mainly for marine fisheries management in Thai waters. For the measures to promote and develop distant water fisheries, they are stated within the last strategy. Those significant measures concerning fishing capacity are to establish

[221] Bycatch can be characterized as catch that may be (i) prohibited to the gear that caught; (ii) too small to sell; (iii) smaller than legal size; and (iv) a target species for which the quota has already been achieved. See, Committee to Review Individual Fishing Quotas National Research Council, *Sharing the Fish:Toward a National Policy on Individual Fishing Quotas* (The National Academies Press, 1999) 123.

[222] Department of Fisheries, above n 66.

[223] Ibid.

three distant water fishing (DWF) databases. The first database consists of information on fishing vessels, crews, and fishing gears gathered from fisheries companies and relevant fisheries organisations. The second database contains the information on available fishing grounds, host countries' fisheries policies and requirements, as well as the information on the operations of RFMOs. For the last database, it contains information on the demands of raw materials for fishing industries. The responsible agencies for the former two databases suggested by the Master Plan are the Department of Fisheries, the Ministry of Foreign Affairs, the Ministry of Transport, and the Fisheries Association of Thailand, whereas the Department of Fisheries, the Ministry of Industry, and the Ministry of Commerce take responsibility for the last one.[224]

Another measure suggested by the Master Plan is to institutionalise distant water fisheries. It is essential to manage distant water fisheries as it is required by relevant laws, international conventions and agreements, as well as the conditions set forth in the agreements. It is also important to set the reasonable penalty for these law violations made by fishers and/or fishing companies. The main responsible bodies suggested for these tasks are the Department of Fisheries, and the Ministry of Foreign Affairs.[225]

It can be seen that various stakeholders, both government and private sectors, are required to cooperate under the Master Plan. The effective implementation of those measures indicated by the Master Plan, therefore, truly depends on such stakeholders' commitments in participation. It is necessary that fishers and concerned agencies must be motivated to endorse the development principles incorporated in the Master Plan, and then solicit their endorsement. Fund allocation for action plan implementation, as well as the monitoring and evaluation of those activities are then needed to carry out.[226] Action plans and their strategic measures respecting fishing capacity controls in Thailand, such as to delimitate the boundaries of fishing zones with due to the subject of equity and transparency, to promote marine fisheries co-management for right-based fisheries,[227] and

[224] Ibid.

[225] Ibid.

[226] Ibid.

[227] These two measures are under Strategy 1 of the Master Plan.

to strengthen the capacity of fisheries organisations,[228] are later reviewed together with the management tools discussed in Chapters 4 and 5.

2.7 Conclusion

This chapter established the importance of the marine capture fisheries sector in Thailand. The chapter discussed marine capture fisheries in Thai waters and distant waters fisheries, and small-scale and large-scale fisheries. Clearly, marine capture fisheries play an essential role for Thailand, including securing domestic food supply, a source of income from exported seafood products, and providing occupation for fisheries communities. Nonetheless, due to the rapid development of marine fisheries without adequate management, Thailand has confronted many problems in its fisheries sector, particularly the issue of overcapacity.

In order to control fishing capacity in Thailand, the legislative frameworks governing fishing vessel registration and fishing gear licensing are implemented. But, due to the loopholes and outdated provisions of the legislative framework derived from the *Fisheries Act B.E. 2490 (1947)*, the problem of overcapacity has remained. The *Fisheries Act B.E. 2558 (2015)* recently enacted and the Master Plan adopted are expected to provide a better legal and management framework in managing fishing capacity for Thailand. In order to address the capacity problem for desirable results, however, supplementary regulations (e.g., Notifications) and technical instruments that support this new legislation also need to be designed and implemented effectively.

[228] This measure is under Strategy 2 of the Master Plan.

CHAPTER 3 LEGAL AND POLICY FRAMEWORK FOR FISHING CAPACITY MANAGEMENT IN GLOBAL AND REGIONAL CONTEXT

3.1 Introduction

This chapter aims to analyse the international and regional instruments that are relevant to fishing capacity management. It consists of three main sections. The first section provides legislative frameworks for fishing capacity management within national jurisdiction and on the high seas by examining relevant provisions of both legally binding and non-legally binding international instruments. International legally binding instruments include the *1982 United Nations Convention on the Law of the Sea*,[1] the *1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*,[2] and the *1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*.[3] This section also discusses the *WTO Agreement on Subsidies and Countervailing Measures* which increasingly impact fishing capacity management at all levels. For non-legally binding instruments, the chapter discusses the *1995 Code of Conduct for Responsible Fisheries*,[4] and the *International Plans of Action for the Management of Fishing Capacity*.[5] The second section focuses on the legal and policy framework for fishing capacity management at the regional level. Under this section, the Conservation and Management Measures of the Indian Ocean Tuna Commission, the Southeast Asian Fisheries Development Center (SEAFDEC) Regional Code of Conduct for Responsible Fisheries, and Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region are mainly discussed. The last main section of this chapter identifies the criteria for fishing capacity management based on the findings in earlier sections. This

[1] The *1982 United Nations Convention on the Law of the Sea*, opened for signature 10 December 1982, ATS31 (entered in to force 16 November 1994).

[2] The *1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*, opened for signature 29 November 1993, ATS 26 (entered in to force 24 April 2003).

[3] The *1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, opened for signature 4 December 1995 (entered in to force 11 December 2001).

[4] The *1995 Code of Conduct for Responsible Fisheries*, adopted 31 October 1995.

[5] The *International Plans of Action for the Management of Fishing Capacity*, adopted February 1999.

set of criteria will be used to measure the adequacy of the legal and policy framework for managing fishing capacity of Thailand in succeeding chapters.

3.2 Legislative Framework for Fishing Capacity Management at Global Level

The United Nations General Assembly Resolution 62/177 in 2008 underscored the current situation that many fish stocks of the world are overfished or partly regulated with enormous fishing efforts. It is in consequence of, among other things, IUU fishing, insufficiency of flag State control and enforcement particularly in terms of MCS, insufficient management measures, harmful subsidies in fisheries, and overcapacity problem.[6] The global issue of overcapacity is recognised as a key fisheries management concern,[7] which needs to be addressed. To effectively manage fishing capacity, therefore, requires the implementation of a wide range of policies and management measures that are aimed to ensure the appropriate balance between fishing inputs and outputs or production in fisheries. In order to develop an appropriate policy framework for managing fishing capacity within and beyond national jurisdiction, fisheries authorities should refer to the relevant international instruments,[8] both legally and non-legally binding. The significant international instruments are reviewed under the following sections.

3.2.1 International Legally Binding Instruments

There are several international fisheries instruments, which, either directly or indirectly, provide standards for coastal States to manage their fishing capacity within their national jurisdiction. The primary international legally binding instruments are discussed below.

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[6] 62/177 Resolution Adopted by the General Assembly: Sustainable Fisheries, Including Through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments, 2.

[7] FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2008* (FAO, 2009) 9.

[8] Steve Cunningham and Dominique Greboval, *Managing Fishing Capacity: A Review of Policy and Technical Issues* (FAO, 2001) 1.

3.2.1.1 The 1982 United Nations Convention on the Law of the Sea

The international instrument of most significant impact in fisheries is the *1982 United Nations Convention on the Law of the Sea*.[9] The *LOSC*,[10] which came into force on 16 November 1994,[11] has many revolutionary features, one of which is the regime of the EEZ[12], which provides the framework for exploring, exploiting, conserving and managing marine living resources as well as non-living resources.[13] In terms of living resources, States are required to determine their allowable catch in their EEZ[14] and must ensure the implementation of appropriate conservation and management measures in order to protect the living resources in the EEZ from overexploitation. In order to achieve this goal, coastal States and international organisations at all levels are also required to cooperate as appropriate.[15] The coastal State is further required to promote the 'optimum utilisation' of living resources[16] by determining its capacity to harvest such resources in national EEZ.[17] It is entitled to reserve for its nationals the total allowable catch (TAC).[18] However, if any coastal State does not have adequate capacity to fish all of the TAC, such State will provide other States access to the surplus through agreements or fishing arrangements.[19] This implies that coastal States are required to

[9] The 1982 United Nations Convention on the Law of the Sea, hereinafter referred to as *LOSC*.

[10] The *LOSC* was adopted by the Third United Nations Conference on the Law of the Sea (UNCLOS III) on 30 April 1982 in New York. The negotiation on the *LOSC* that was aimed to establish a comprehensive constitution for the oceans took nine years. The *LOSC* was concluded and opened for signature on 10 December 1982 at Montego Bay, Jamaica. See, United Nations, *The United Nations Convention on the Law of the Sea (A historical perspective)* United Nations <http://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm>; United Nations, *United Nations Convention on the Law of the Sea of 10 December 1982 : Overview and Full Text* (8 April 2009) United Nations <http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm>.

[11] United Nations, above n 10.

[12] *LOSC* part V.

[13] *LOSC* art 56(1)(a). It provides '(a) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;'

[14] *LOSC* art 61(1).

[15] *LOSC* art 61(2).

[16] *LOSC* art 62(1).

[17] *LOSC* art 62(2).

[18] Jose A De Yturriaga, *The International Regime of Fisheries: From UNCLOS 1982 to the Presential Sea,* A Series of Studies on the International, Legal, Institutional and Policy Aspects of Ocean Development (Kluwer Law International, 1997) 116.

[19] *LOSC* art 62(2).

limit its fishing capacity in EEZ fisheries in order to discharge their conservation obligations under the *LOSC*.

In addition, coastal States are required to adopt laws and regulations on the conservation and management of EEZ's living resources consistent with the *LOSC*.[20] Particularly, coastal States are required to 'determining the species which may be caught, and fixing quotas of catch, whether in relation to particular stocks or groups of stocks or catch per vessel over a period of time or to the catch by nationals of any State during a specified period'.[21] Coastal States are further required to 'regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used.'[22] This clearly shows that the *LOSC* requires coastal States to control their fishing capacity, i.e., types, sizes and number of fishing gears and vessels, employed in their EEZs as at the level that is commensurate with the catch quota of the allowed species stocks during fishing seasons and areas assigned. Additionally, fishers and fishing vessels are obliged to be licensed and pay fees,[23] so that the actual numbers of fishers and fishing vessels will be obtained and used for effective fishing capacity management.

The rights and responsibilities of coastal States in regard to their fisheries on the high seas are also defined in the *LOSC*.[24] States are required to cooperate with other States to conserve and manage living resource in the high seas areas, through subregional or regional fisheries organisations.[25] Conservation and management measures of RFMOs, particularly the Indian Ocean Tuna Commission (IOTC), as a regional legislative framework for fishing capacity management, will be discussed in detail under Section 3.3.1 of this chapter.[26]

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[20] *LOSC* art 62(4).

[21] *LOSC* art 62(4)(b).

[22] *LOSC* art 62(4)(c)

[23] *LOSC* art 62(4)(a). It provides that coastal States shall conduct 'licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration, which, in the case of developing coastal States, may consist of adequate compensation in the field of financing, equipment and technology relating to the fishing industry;'.

[24] *LOSC* arts 116-20.

[25] *LOSC* art 118.

[26] To date, Thailand has been a member of only one RFMO, which is the IOTC, and has been a Participating Non-Member State of WCPFC.

For the purpose of conservation and management of the living resources on the high seas, the *LOSC* requires States to implement measures aimed to sustain or restore populations of fisheries species as at levels that provide the MSY of such species on the high seas.[27] Thus, States, through RFMOs, are required to determine the MSY of harvested species in areas concerned, as well as the commensurate fishing effort for that MSY. Therefore, participating States of RFMO harvest their catch based on allocated quota, and thus fishing capacity on the high seas is addressed within a catch quota system.[28] However, the *LOSC* also provides that States should 'ensure that conservation measures and their implementation do not discriminate in form or in fact against the fishermen of any State',[29] which implies that participating States cannot deny nationals of new participating or non-participating States to access the catch quotas. Thus, the existing participants possibly have no incentives to rebuild stocks if the benefits of rebuilding are to be shared with additional participants. As a result, the conservation goals on the high seas could be difficult to achieve,[30] as well as fishing capacity on the high seas could not be controlled effectively. Therefore, the *LOSC* alone seems not adequate to be a framework for managing fishing capacity on the high sea areas.

3.2.1.2 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas

In an attempt to address the inadequacy of the management framework on the high seas, the *1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*[31] was approved at the 27th Session FAO Conference.[32] This *FAO Compliance Agreement*, which is consistent with the *LOSC*, is a significant international agreement, which supports a framework of bilateral, regional, and multilateral on the conservation and management of high sea

[27] *LOSC* art 119(1)(a).

[28] Christopher Newton, 'Review of Issues for the Control and Reduction of Fishing Capacity on the High Seas' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper (FAO, 1999) vol 386, 206, 55.

[29] *LOSC* art 119(3).

[30] Newton, above n 28.

[31] The 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, hereinafter referred to as *FAO Compliance Agreement*.

[32] The 27th Session was held in Rome on 24 November 1993. The FAO Compliance Agreement was entered into force on 24 April 2003, upon deposit of the 25th instrument of ratification. See, William Edeson, *Fisheries and Aquaculture topics. FAO Compliance Agreement. Topics Fact Sheets.* (27 May 2005) <http://www.fao.org/fishery/topic/14766/en>.

fisheries. The *FAO Compliance Agreement* also develops a core component of the *FAO Code of Conduct for Responsible Fisheries* that provides principles and standards of behaviours for responsible fishing.[33]

The *FAO Compliance Agreement* aims to prevent the reflagging of fishing vessels,[34] which has been conducted as a way to avoid the compliance with international conservation and management measures due to the fact that States inefficiently govern their vessels and/or that are not a member of, or do not cooperate with, RFMOs.[35] The conduct of reflagging is normally connected with IUU fishing, as, for example, it is in violation of international obligations. It also undermines the effectiveness of controls on fishing capacity employed on the high seas. The *FAO Compliance Agreement* attempts to tackle such issue by urging flag States to strengthen and enhance their responsibilities on their vessels operating on the high seas. Particularly, the *FAO Compliance Agreement* requires flag States to use an appropriate process to authorise the vessels to fish on the high seas.[36] Furthermore, States are needed to make certain that their authorised fishing vessels will operate on the high seas with the conditions of the authorisation,[37] which implies that States can legally exert control over the fishing vessels before authorising them to operate on the high seas. Flag States can therefore limit the level of their fishing capacity, e.g., types, sizes and number of fishing gears and vessels, employed on the high seas. Moreover, States are not allowed to authorise fishing vessels that have a history of non-compliance with international conservation

[33] Primary Production Committee, 'International Treaty Examination of the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Sea' (10 June 2005) <http://www.parliament.nz/resource/en-nz/47DBSCH_SCR3137_1/105a01a5d53ee8c6145e80ed305e7736894bc403>.

[34] Re-flagging is the act of changing the national registration of a fishing vessel and hence its national flag, as a means of avoiding compliance with international conservation and management measures. See, Gerald Moore, 'The FAO Compliance Agreement' in Myron H Nordquist and John Norton Moore (eds), *Current Fisheries Issues and the Food and Agriculture Organisation of the United Nations* (Martinus Nijhoff Publishers, 2000) 77.

[35] *FAO Compliance Agreement* art III(1)(a). It provides that 'Each Party shall take such measures as may be necessary to ensure that fishing vessels entitled to fly its flag do not engage in any activity that undermines the effectiveness of international conservation and management measures.'; article V(1) provides that 'The Parties shall cooperate as appropriate in the implementation of this Agreement, and shall, in particular, exchange information, including evidentiary material, relating to activities of fishing vessels in order to assist the flag State in identifying those fishing vessels flying its flag reported to have engaged in activities undermining international conservation and management measures, so as to fulfil its obligations under Article III.'

[36] *FAO Compliance Agreement* art III(2).

[37] *FAO Compliance Agreement* art III(2).

and management measures.[38] Besides, the *FAO Compliance Agreement* introduces the process for data and information exchange of high seas fishing vessels, and gives the standard for enhanced international cooperation in order to achieve the effectiveness of international conservation and management measures complied on the high seas.[39] Such measures are hoped to get rid of IUU fishing and control the level of fishing capacity that ensures not only the sustainability of fish stocks but also the protection of biodiversity[40] from negative impacts of fishing activities on the high seas.[41]

Based on the aforementioned provisions, the *FAO Compliance Agreement*, therefore, governs the control over fishing capacity of State parties' fishing fleets, which operate on the high seas. Additionally, although there could be no identifiable incentives for flag States to restrict the capacity of their fleets provided in open access conditions in high sea fisheries, the data on fishing vessels authorised to operate on the high seas collated by FAO[42] through the *FAO Compliance Agreement* would allow for monitoring of capacity among States.[43] The *FAO Compliance Agreement* establishes this

[38] *FAO Compliance Agreement* art III(5)(a).

[39] *FAO Compliance Agreement* art VI.

[40] For example, the *FAO Compliance Agreement*, among multiple treaties, has reinforced the pledge to protect deep-sea biodiversity from high seas bottom trawling and to conserve and manage bottom fisheries on the high seas. See, Environment and Conservation Organisations of New Zealand, *Deep Sea Conservation: UN General Assembly Process* (20 July 2012) <http://www.eco.org.nz/main-menu/publications/deep-sea-conservation.html>; 64/72 Resolution Adopted by the General Assembly: Sustainable Fisheries, Including Through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments; 61/105 Resolution Adopted by the General Assembly: Sustainable Fisheries, Including Through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments.

[41] Primary Production Committee, above n 33.

[42] A database called the High Seas Vessel Authorization Record (HSVAR) was developed for this purpose in 1994. However, the technology used for that database is now outdated and needs to be developed in a new environment, which provides an opportunity to expand the technical content to meet other information needs and fishery status and trends reporting in general. To serve these demands, FAO has developed with extra-budgetary assistance a Fisheries Global Information System (FIGIS) as a web-based information management tool to exchange and disseminate fisheries information with partner organisations, such as international organisations, regional fishery bodies and national scientific institutes. See, Richard Grainger, 'High Seas Fishing Vessel Database' in Myron H Nordquist and John Norton Moore (eds), *Current Fisheries Issues and the Food and Agriculture Organisation of the United Nations* (Martinus Nijhoff Publishers, 2000) 93. Such organisations, which are willing to report and share information on status and trends of fishery resources, have formed a partnership and collaborated within a formal agreement of the Fishery Resources Monitoring System (FIRMS). See, FIRMS, 'FIRMS Information Management Policy' (FIRMS FSC4/2007/Inf.3, FAO, 2007) <ftp://ftp.fao.org/fi/DOCUMENT/FIGIS_FIRMS/2007/inf3e.pdf>.

[43] Newton, above n 28, 63.

mechanism and, coupled with the development of its 24 hour a day electronic access to its world list of authorisations, provides a basic tool for compliance and enforcement of authorisations to all regional fishery organisations.[44] This data bank, even it may not include vessels smaller than 24 metres in length that are exempted to comply with administrative provisions of this agreement,[45] would provide the information necessary for assessing the capacity of the high seas fleets,[46] which will be helpful in managing fishing capacity on the high seas.

3.2.1.3 The 1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

To specifically address the conservation and management of straddling fish stocks and highly migratory fish stocks,[47] the *1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*[48] was adopted on 4 August 1995, and entered into force on 11 December 2001.[49] The *Fish Stocks Agreement* is an elaboration of Articles 63(2)[50] and

[44] Ibid 57.

[45] *FAO Compliance Agreement* art II(2). See, FAO, *International Fisheries: Instruments with Index* (Division of Ocean Affairs and the Law of the Sea Office of Legal Affairs, 1998) 42-3.

[46] Newton, above n 28, 57.

[47] Straddling fish stocks are the fish stocks that straddle the boundary of a State's EEZ and the high seas (some fish stocks might straddle out of an EEZ area, whereas some fish stocks might straddle into an EEZ area). On the other hand, highly migratory fish stocks are fish stocks that normally travel covering large distances and can be found in a number of EEZs and the high seas. Highly migratory species are listed in Annex 1 of the *LOSC*. See, *LOSC* annex I.

[48] The 1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, hereinafter referred to as *Fish Stocks Agreement*.

[49] *The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (In Force as from 11 December 2001): Overview* (31 July 2013) <http://www.un.org/depts/los/convention_agreements/convention_overview_fish_stocks.htm>.

[50] *LOSC* art 63(2). It suggests that 'Where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate subregional or regional organisations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area.'

64(1)[51] of the *LOSC*, and was an effort to curb rising conflicts and unilateral actions regarding the rights and duties of States to exploit and manage straddling and highly migratory fish stocks. It provides a legal basis for adopting management measures that incorporate new environmental principles, provisions on compliance and enforcement, as well as the duty of states to cooperate.[52] These measures are aimed to benefit species that are fished on the high seas and throughout the range of stocks in the medium to long term.[53]

More importantly, the *Fish Stocks Agreement* provides a legal basis for eliminating excess fishing capacity, as it requires coastal States and flag States operating on the high seas to 'take measures to prevent or eliminate overfishing and excess fishing capacity and to ensure that levels of fishing effort do not exceed those commensurate with the sustainable use of fishery resources'.[54] States are further required to adopt the precautionary approach to conserve, manage, and exploit straddling fish stocks and highly migratory fish stocks[55] by setting precautionary reference points,[56] as well as implement measures to make certain that the exploitation level of these resources is not over the reference points.[57] Precautionary reference points include limit reference points and target reference points.[58] Although no specifics are provided, it must be assumed that limit reference points should take into consideration excess fishing capacity. By setting limit reference points lower than biological requirements (e.g., MSY) to take

[51] *LOSC* art 64(1) suggests that 'The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organisations with a view to ensuring conservation and promoting the objective of optimum utilisation of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organisation exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organisation and participate in its work.'

[52] Tore Henriksen, Geir Honneland and Are Sydnes, *Law and Politics in Ocean Governance: The Un Fish Stocks Agreement and Regional Fisheries Management Regimes* A Series of Studies on the International, Legal, Institutional and Policy Aspects of Ocean Development (Martinus Nijhoff Publishers, 2006) 1.

[53] FAO Fisheries and Aquaculture Department, above n 7, 35.

[54] *Fish Stocks Agreement* art 5(h).

[55] *Fish Stocks Agreement* art 6(1).

[56] A precautionary reference point refers to 'an estimated value derived through an agreed scientific procedure, which corresponds to the state of the resource and of the fishery, and which can be used as a guide for fisheries management.' See, *Fish Stocks Agreement* annex II(1).

[57] *Fish Stocks Agreement* art 6(4).

[58] Limit or conservation reference points set catch ceiling aimed to control the harvest to be under safe biological limits that the stocks can produce MSY, whereas target or management reference points are adopted to achieve management objectives. See, *Fish Stocks Agreement* annex II(2).

into consideration excess capacity, this would provide an incentive for flag States to adjust their capacity as a means to increase catch levels.[59] For example, States should control their fishing capacity to not being above the level that can produce the MSY.

However, to apply measures for fishing capacity by individual States under open access conditions would conflict the interest of any State, unless appropriate arrangement has been developed, and consented to, by a regional or subregional fishery organisation and applied to all participating States.[60] For instance, if the programs to limit fishing capacity of tuna purse seines fisheries are needed,[61] there could be a problem to enlist the cooperation of concerned States that want to expand their tuna fleets, particularly developing States who currently do not have any tuna fleets or have small ones.[62] Additionally, based on the experiences of RFMOs, there have been difficulties in setting TACs due to data limitations (e.g., under-reported data, uncertainty of data) for stock assessments.[63] Thus, the MSY analysed from limited data could be unreliable.[64] Consequently, using such MSY as a reference point in managing fleet capacity by RFMOs would not truly achieve the effective results, and probably undermine the conservation of concerned stock.

Additionally, in terms of controlling access of non-member vessels of the *Fish Stocks Agreement* within the competence areas of regional fishery organisations, the *Fish*

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[59] Newton, above n 28, 67.

[60] Ibid 56.

[61] It has been found that, at global level, there is more purse seine fishing capacity than needed to harvest current level of tuna catch. See, James Joseph et al, 'Addressing the Problem of Excess Fishing Capacity in Tuna Fisheries' (Inter-American Tropical Tuna Commission, 2006) http://www.iattc.org/PDFFiles2/Fleet-capacity-Oct2006.pdf 7.

[62] Ibid.

[63] For example, the ICCAT has found that the catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The Standing Committee on Research and Statistics (SCRS) has estimated the catches during this period could have been on the order of 50,000 to 61,000 tonnes per year based on the number of vessels operating in the areas. See, ICCAT, 'Report of the Standing Committee on Research and Statistics (SCRS)' (The International Commission for the Conservation of Atlantic Tunas, 3-7 October 2011) <http://www.iccat.es/Documents/Meetings/Docs/SCRC2011-Report-ENG.pdf> 78.

[64] For instance, the IOTC Scientific Committee (SC) reported that although the IOTC at its 15th Session did not request for a new assessment of albacore stock to be taken in 2011, there remains considerable uncertainty about the relationship between abundance and the standardized CPUE series of albacore. Therefore, the SC suggested that there should be an urgent need to carry out a revised stock assessment for the albacore resource in the Indian Ocean in 2012. See, IOTC, 'Report of the Fourteenth Session of the IOTC Scientific Committee' (IOTC-2011-SC14-R[E], IOTC, 12-17 December 2011) <http://www.iotc.org/files/proceedings/2011/sc/IOTC-2011-SC14-R[E].pdf> para 32.

Stocks Agreement, under article 17, provides that 'A State which is not a member of a subregional or regional fisheries management organisation or is not a participant in a subregional or regional fisheries management arrangement, and which does not otherwise agree to apply the conservation and management measures established by such organisation or arrangement, is not discharged from the obligation to cooperate, in accordance with the Convention and this Agreement, in the conservation and management of the relevant straddling fish stocks and highly migratory fish stocks'[65] and therefore 'Such State shall not authorise vessels flying its flag to engage in fishing operations for the straddling fish stocks or highly migratory fish stocks which are subject to the conservation and management measures established by such organisation or arrangement.'[66] Moreover, States, who are parties of such organisations or participants in regional arrangements 'shall take measures consistent with this Agreement and international law to deter activities of such vessels which undermine the effectiveness of conservation and management measures.'[67] This is presumed that the outcome of these actions is acceptance of the conservation and management measures by any States that fish for straddling fish stocks and highly migratory fish stocks. The international action that can be taken to ensure non-cooperating states revoke authorisations to fish is, however, not specified.[68] The *Fish Stocks Agreement* further provides that 'States shall assist each other in identifying vessels reported to have engaged in activities undermining the effectiveness of subregional, regional or global conservation and management measures.'[69] This provision suggests that the international action is restricted to a form of 'blacklisting' of non-complying vessels and/or their flag States.[70] Such vessels would therefore be prohibited to operate and then the fishing capacity associated would be reduced.

However, although the *Fish Stocks Agreement* requires flag States to record detail and information of any fishing vessels that are authorised to operate on the high seas,[71] it

[65] *Fish Stocks Agreement* art 17(1)

[66] *Fish Stocks Agreement* art 17(2).

[67] *Fish Stocks Agreement* art 18(4).

[68] Newton, above n 28, 57.

[69] *Fish Stocks Agreement* art 20(4).

[70] Newton, above n 28, 57.

[71] *Fish Stocks Agreement* art 18(3)(c). It states that the measures should be implemented by a State with regard to vessels flying its flag will include 'establishment of a national record of fishing vessels authorized to fish on the high seas and provision of access to the information contained in that record on

does not require States to provide the detail of such authorisations to a depository collating all states' authorisations. This could be an obstacle in assessing the level of fishing capacity on the high seas.[72] Moreover, although the *Fish Stocks Agreement* imposes the obligations on flag States to adhere to conservation and management measures required by regional fishery organisations, particular measures needed to address overcapacity in participating fishing fleets are not specified.[73]

Besides, the expansion of fishing fleets beyond the areas of national EEZ into the high seas also raises questions when straddling fish stocks and highly migratory fish stocks are found on high sea areas, which are not the competence areas of any regional fishery organisation. This gap in the legal framework causes difficulties in effectively implementing the *Fish Stocks Agreement*.[74] This similar issue also happens with species that are not either straddling fish stocks or highly migratory fish stocks but found on high seas areas. Currently, although there is an attempt to address this gap, it concerns only particular high seas areas, e.g., high seas in the South Pacific.[75] The conservation and management measures for non-highly migratory fish stocks should be widely implemented in all high seas areas.

Overall, one of the most important contributions of the *Fish Stocks Agreement* was international acceptance of the need of flag States to authorise their high seas fishing vessels.[76] Based on this empowerment provided by the *Fish Stocks Agreement*, flag States can control capacity of their high seas fishing fleets by applying regulations, such as gear and vessel restrictions. Nonetheless, as the *Fish Stocks Agreement* provides States the guidelines that only focus on fisheries of straddling fish stocks and highly migratory fish Stocks on the high seas and do not concern the authorization of fishing

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request by directly interested States, taking into account any national laws of the flag State regarding the release of such information;'

[72] It is unless States are parties of RFMOs that require participating States to provide such details.

[73] Newton, above n 28, 57.

[74] Ibid 64.

[75] Participating States of the South Pacific Regional Fisheries Management Organisation (SPRFMO), which has entered into force on 24 August 2012, are committed to the long-term conservation and sustainable use of non-highly migratory fish species (pelagic and benthic) on the high seas of the South Pacific Ocean and in so doing safeguarding the marine ecosystems in which the resources occur. See, SPRFMO, *South Pacific Regional Fisheries Management Organisation (SPRFMO)* <http://www.southpacificrfmo.org/>.

[76] Newton, above n 28, 206.

vessels for other fisheries, using this instrument as an only legal framework, therefore, cannot control capacity of fishing fleets operating on the high seas as a whole. Adopting the *1995 Code of Conduct for Responsible Fisherie*s has subsequently addressed this issue.[77]

3.2.1.4 The World Trade Organisation Agreement on Subsidies and Countervailing Measures

As some types of subsidy in fisheries can contribute to the problem of overcapacity and overfishing,[78] another legally binding instrument that will play an important role in controlling fishing capacity at global level is the World Trade Organisation (WTO) Agreement on Subsidies and Countervailing Measures.

Subsidies refer to financial contributions that are provided by governments or any public agencies[79] and give a private benefit.[80] Subsidies provided in fisheries sector can be either direct, such as vessel buyback programs, or indirect, such as waived tax on fuel, and may be given for necessary materials and services, revenue or price support.[81] The fisheries subsidies can be categorised into eight groups, including 'fisheries infrastructure',[82] 'management services and research',[83] 'subsidies for accessing to other States' EEZs',[84] 'removal of vessels and withdrawal of licenses',[85] 'subsidies to capital

[77] Details in this regard are discussed under section 3.2.2.1.

[78] WTO, 'Annual Report 2014' (2014) <https://www.wto.org/english/res_e/booksp_e/anrep_e/anrep14_e.pdf> 38.

[79] The WTO Agreement on Subsidies and Countervailing Measures art 1.

[80] William E Schrank, *Introducing Fisheries Subsidies* (FAO, 2003) 2.

[81] Ibid 11-14.

[82] They include port facilities and free or low rates of moorage for fishing vessels; improvement of fishing port infrastructure, e.g., support to producer agencies – institution infrastructure. On the other hand, they exclude general infrastructures, e.g., roads and ports that are served for general public and all industries that are involved in trade. See, Anja von Moltke (ed), *Fisheries Subsidies, Sustainable Development, and the WTO* (Earthscan, 2010) 21-2.

[83] These programmes concern stock enhancement, e.g., fish habitat rehabilitation, release of fish seeds; fisheries management, e.g., MCS; fisheries enforcement, e.g., prosecuting of law violation; fish stock assessment; identification and development of new fisheries; Research and Development for new fisheries technologies; marine protection areas etc. See, ibid 23.

[84] They include partly financial support of the costs for accessing other EEZs' waters based on international fishing access agreements. See, ibid 23.

[85] They include money compensation for the permanent withdrawal of fishing vessels and fishing permits. See, ibid 24.

costs',[86] 'subsidies to variable costs',[87] 'revenue support and unemployment insurance',[88] and 'subsidies for price support'.[89]

Since the 1990s, inappropriate fisheries subsidies have been recognised as a significant factor contributing to overfishing and to the overcapitalisation of fishing fleets.[90] Foreign and international governmental organisations (IGOs), for example, the United Nations Environment Programme (UNEP), and non-governmental Organisations (NGOs), such as World Wildlife Fund (WWF), have brought increased intention to this issue,[91] as well as some developed and developing States that together formed a coalition[92] in the World Trade Organisation (WTO), calling themselves the 'Friends of Fish (FoFs)'.[93] This group has made efforts to put fisheries subsidies on the WTO negotiation agenda in order to seek for significant reduction of fisheries subsidies that have led to the problems of overcapacity and overfishing.[94]

Eventually, in 2001 when the WTO Ministers gathered at the 4th Ministerial Meeting in Doha, member States were called 'to clarify and improve WTO disciplines on fisheries subsidies, taking into consideration the importance of fisheries sector to developing

[86] They include, for example, grants for fleet renewal and modernization; expedited depreciation that decreases taxation of fishing vessels and fishing gears; grants for fisheries company development; assistance to dockyards that support fishing vessel construction. See, ibid 25.

[87] They include, for instance, the subsidies for fuel tax waiver or drawback for vessels; income tax postponement for fishers; vessels insurance and reinsurance programmes; subsidies to decrease prices of baits; compensation for damaged gear; and subsidies for transport. See, ibid 25.

[88] They are, such as supplementary incomes for fishers and fisheries workers; payments for unemployed fisheries workers; and payments to vessel owners for temporary stop of fishing. See, ibid 26.

[89] They are, for example, the government support to guarantee minimum prices of fish or to keep fish prices in domestic markets above the prices in world markets. See, ibid 26.

[90] UNEP, 'The WTO Fishery Subsidies Negotiations: Update and Introductory Briefing for New Delegates' (1 April 2009) http://www.unep.ch/etb/events/WTO%20FS%20workshop%201%20Apr%202009/Meeting%20Report%20UNEP-WWF%20Briefing%201April09.pdf. para 8.

[91] Ibid.

[92] A number of States have formed coalitions in the WTO. Each group normally speaks with one voice using a single coordinator or negotiating team. See, WTO, *Groups in the Rules Negotiations* (10 September 2014) <https://www.wto.org/english/tratop_e/rulesneg_e/rules_groups_e.htm>.

[93] FoFs consists of 11 WTO members, i.e., Argentina, Australia, Chile, Colombia, Ecuador, Iceland, New Zealand, Norway, Pakistan, Peru and United States of America. See, ibid.

[94] FoFs claims that estimated subsidies to the fisheries sector are about USD14-20.5 billion annually, or 20-25 per cent of revenues that have contributed to overcapacity and overfishing problems. See, WTO, *Rules: AD, SCM including Fisheris Subsidies: Negotiations to Clarify and Improve Disciplines* WTO <http://www.wto.org/english/thewto_e/minist_e/min05_e/brief_e/brief08_e.htm>.

countries.'[95] The fisheries subsidies negotiations thus become one of the subjects in the core agenda of the WTO rules at Doha Ministerial Meeting.[96] The international diplomatic pressure for a strong outcome to the fisheries subsidies negotiations grew steadily. Therefore, to re-emphasise the Doha Declaration's call, in 2002 heads of States gathered at the World Summit on Sustainable Development in Johannesburg, called on governments to eliminate fisheries subsidies, which contribute to overcapacity, through effective new WTO rules on fisheries subsidies.[97]

However, when a major UNEP workshop held in Geneva in 2004 moved the negotiations from the question of 'whether' to the question of 'how' fisheries subsidies could be reformed through WTO rules,[98] the focus of the discussions is therefore on the approach to new disciplines and their structure.[99] Later in 2005, the WTO Ministerial Conference in Hong Kong issued a significantly strengthened negotiating mandate that expressly called for a ban on subsidies, which lead to the problem of overcapacity and overfishing, with special and differential treatment (S&DT)[100] for developing States.[101] Furthermore, this conference assigned the chairperson to draft consolidated texts of the

[95] Peter Manning, *World Inventory of Fisheries. Subsidies in Fisheries. Issues Fact Sheets* (27 May 2005) <http://www.fao.org/fishery/topic/13333/en>.

[96] At the Doha Ministerial Conference, WTO Members agreed to start negotiations in the area of 'WTO Rules'. These negotiations concern the matters of: the Agreement on Implementation of article VI of GATT 1994 (or better known as the Anti-dumping Agreement); the Agreement on Subsidies and Countervailing Measures, particularly WTO disciplines on fisheries subsidies; and WTO provisions that apply to regional trade agreements. See, WTO, *The Rules Negotiations* (26 February 2015) <http://www.wto.org/english/tratop_e/rulesneg_e/rulesneg_e.htm>.

[97] Manning, above n 95.

[98] UNEP, above n 90, para 29.

[99] WTO, above n 94.

[100] In the context of globalization, special and differential treatment (S&DT) is the product of the coordinated political efforts of developing countries to correct the perceived inequalities of the post-war international trading system by introducing preferential treatment in their favour across the spectrum of international economic relations. See, Murray Gibbs, 'Special and Differential Treatment in the Context of Globalization' (UNCTAD, 10 December 1998). Under the WTO Agreements, there are special provisions that provide developing countries special rights and give developed countries the possibility to treat developing countries more favourably than other WTO Members. Such special provisions include extended periods for implementing Agreements and commitments, measures to support trading opportunities for these countries, provisions that require all WTO members to protect the interests on trade of developing countries, support for developing countries to build the infrastructure for WTO work, handle disputes, and implement technical standards, and provisions related to least-developed country (LDC) Members. See, WTO, *Work on Special and Differential Provisions* (2015) <http://www.wto.org/english/tratop_e/devel_e/dev_special_differential_provisions_e.htm>.

[101] UNEP, above n 90, para 9.

Anti-Dumping and Subsidies Agreements that will be used as a foundation of negotiations in final stage.[102]

Steady progress has been achieved since the negotiations were launched. In 2007, the chairman[103] of the Negotiating Group on Rules tabled his 'Draft Consolidated Chair Texts of the Anti-Dumping (AD) and Subsidies and Countervailing Measures (SCM) Agreements' containing new WTO fishery subsidies disciplines.[104] This draft, for the first time in GATT/WTO, proposes a broad range of prohibitions in fisheries subsidies that contribute to overfishing and overcapacity, such as subsidies for repair or modification of fishing vessels and construction of new fishing vessels[105] and subsidies that benefit to operating costs of fishing or service vessels (including licence fees or similar charges, ice, fuel, baits, workers, social expenses, insurance, gears, and support in the sea).[106] It also proposes general exceptions to the prohibitions for all WTO members and S&DTs for developing States, especially for small-scale fishing in their territorial waters.[107] However, these general exception and S&DTs are conditional on WTO members who have in place a fishery management system designed to prevent overfishing.[108] The draft further requires that WTO members who wish to grant a subsidy that would fall under the general exception or S&DT provisions, must notify FAO of their management system. FAO is then proposed to undertake a peer review of the management system prior to the granting of the subsidy.[109] Nevertheless, many elements in this draft raised controversy and uncertainty.[110] One of the issues concerns

[102] WTO, *Rules* <http://www.wto.org/english/tratop_e/dda_e/meet08_brief04_e.doc>.

[103] The chairman of the Negotiating Group on Rules was Amb. Guillermo Valles Galmés of Uruguay. See, ibid.

[104] WTO, *Rules Negotiations: Chairperson's Texts 2007: Draft Consolidated Chair Texts of the AD and SCM Agreements* (30 November 2007) WTO <http://www.wto.org/english/tratop_e/rulesneg_e/rules_chair_text_nov07_e.htm>.

[105] Ibid annex III Fisheries Subsidies art I.1(a).

[106] Ibid annex III Fisheries Subsidies art I.1(c).

[107] Ibid annex III Fisheries Subsidies art III.2(a)(1). With this regard, small coastal States, i.e., Antigua and Barbuda, Barbados, Dominican, Republic, Fiji, Grenada, Guyana, Jamaica, Papua New Guinea, St. Kitts and Nevis, St. Lucia, Solomon Islands, and Trinidad and Tobago, have together asked several exemptions from any new disciplines, considering the importance of fisheries in their economic affairs, and the characteristics of their artisanal and small-scale fisheries. See, WTO, above n 94.

[108] WTO, above n 104, annex III Fisheries Subsidies art III.2(a)(3).

[109] Ibid annex III Fisheries Subsidies art III.2(b)(3). However, at this stage the negotiations in the WTO are still going on. When the fisheries subsidies negotiations have been concluded, the agreed text will clarify FAO's intended role and the nature of the peer view. See, FAO Fisheries and Aquaculture Department, above n 7, 79.

[110] UNEP, above n 90, para 10.

the subsidies to be prohibited. In the WTO subsidies negotiations, there are two main negotiating positions, i.e., 'top-down approach' by FoFs, who argue that all fisheries subsidies should be prohibited apart from certain exemptions, and 'bottom-up approach' which argues that all subsidies should be allowed, apart from those, which are specifically prohibited. Members of the latter group include Japan, the Rep. of Korea, Chinese Taipei and the EU.[111] Japan, the Rep. of Korea and Chinese Taipei have also doubted about the link between subsidies and overfishing. They have claimed that the depletion of fish stocks is largely caused by the inadequacy of fisheries resources management.[112] Other controversial issues include the criteria to be used in identify eligible fisheries for S&DT; territorial limits on the use of S&DT; the need for effective management of subsidies fisheries; and issues about transparency and enforcement.[113]

As a consequence, in December 2008, the chairman recognised the need for continuing discussion about the issues raised, and accordingly issued new draft texts of the AD and SCM Agreements,[114] which reflect a new bottom-up approach[115] and contain a 'roadmap' to guide the further discussions on the strengthening of disciplines, particularly through a prohibition, on subsidies that contribute to overcapacity or overfishing.[116] The roadmap identifies the key questions needed to be addressed in fisheries subsidies, including questions about which particular subsidies that should be or should not be prohibited and why,[117] what measures that should be included in a list of general exceptions,[118] if S&DT is allowed for developing States, which exemption should be conditional on fisheries management,[119] whether there are other conditionalities that should be applied to exceptions (general and S&DT), either in

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[111] MRAG Limited, *Policy Brief 9: Fisheries Subsidies and the WTO negotiations* <http://www.mrag.co.uk/Documents/PolicyBrief9_Subsidies_insert_Apr09.pdf>.

[112] WTO, above n 94.

[113] MRAG Limited, above n 111.

[114] WTO, *New Draft Consolidated Chair Texts of the AD and SCM Agreements: Fisheries Subsidies-Roadmap for Discussions* (19 December 2008) <http://www.wto.org/english/tratop_e/rulesneg_e/rules_dec08_e.doc>.

[115] This is based on the suggestions of member States on Draft Consolidated Chair Texts of the AD and SCM Agreement proposed in November 2007. See, ibid.

[116] Ibid, Roadmap for discussions, para 3.

[117] Ibid, Prohibition para 11.

[118] Ibid, General Exceptions para 13.

[119] Ibid, Special and Differential Treatment para 15.

addition to or instead of fisheries management conditionalities,[120] and what notification mechanisms that should be formulated for members to report on subsidies they are providing,[121] and for other issues as well.[122]

This roadmap was used as the basis for discussions in 2009.[123] These discussions provided participants an opportunity to discuss current issues of fisheries subsidies in 'off the record' and informal workshop.[124] At the workshop, some elements, fuel subsidies in particular, still raised controversy. It has been recognised that fuel subsidies are difficult to manage because of their combination of very high environmental relevance, direct impacts on livelihoods, market competitiveness, and political factors.[125] In order to address this issue, there were possible solutions proposed, including the use of transition periods, subsidy ceilings, stand-still agreements and roll-backs, or other limitations on time and relative level of subsidisation.[126] Although many proposals and ideas respecting fisheries subsidies were submitted by the WTO members and they were useful and constructive, such proposals and ideas revealed widely divergent views including the technical issues.[127] Thus, at this stage the Chairman of the Negotiating Group on Rules is still unable to table a new bottom-up, convergence legal text on fisheries subsidies.[128] Therefore, the negotiations in the WTO are still in

[120] Ibid, Fisheries Management Conditionalities para 20.

[121] Ibid, Transparency art 22.

[122] Ibid para 23-7.

[123] The roadmap was used as the basis for discussions of 'the WTO Fishery Subsidies Negotiations: Update and Introductory Briefing for New Delegates', which was supported by UNEP and WWF experts and held at the WTO on 1 April 2009. See, Jariya Kankamnerd, 'Progress of WTO Negotiations and Regional Policy Directives and Common Positions on Fisheries Subsidies' (Paper presented at the ASEAN-SEAFDEC Regional Technical Consultation on International Fisheries Related Issues 2010, Bangkok, Thailand, 2-4 February 2010) <http://www.seafdec.org/cms/index.php?view=article&catid=82%3Aevents-calendar&id=152%3Aasean-seafdec-rtc-on-international-fisheries-related-issues-2-4-february-2010-bangkok-thailand&option=com_content&Itemid=118> 2.

[124] Ibid.

[125] Fuel subsidies are widely employed based on a large percentage of fisheries subsidies. In the discussions at the WTO, however, countries reported vast differences in the way fuel subsidy programs were administered and structured, and this makes it difficult to determine direct impacts. See, Manleen Dugal and Hugh Walton, 'WTO Fisheries Subsidies Negotiations and Pacific Island States' (2011) 10(8) (November) *Trade Negotiations Insights* 20, 15.

[126] UNEP, above n 90.

[127] WTO, 'Annual Report 2012' (2012) <http://www.wto.org/english/res_e/booksp_e/anrep_e/anrep12_e.pdf> 32.

[128] The members of the WTO mainly want only Chair-produced text with a bottom-up nature. See, Negotiating Group on Rules WTO, 'Communication from the Chairman' (21 April 2011).

progress.[129] However, once the AD and SCM Agreements are finalised and put into effect, they will be an instrument that plays an important role to control fishing capacity both in member countries and global level.

3.2.2 International Non-Legally Binding Instruments

Apart from the international legally binding instruments mentioned above, a number of non-legally binding instruments are further adopted as a fundamental framework to manage fishing capacity in broader scope. The remarkable instruments are the *1995 Code of Conduct for Responsible Fisheries* and the *International Plans of Action for the Management of Fishing Capacity*.

3.2.2.1 The 1995 Code of Conduct for Responsible Fisheries

The *Code of Conduct for Responsible Fisheries* (*CCRF*) was adopted by more than 170 FAO member States on 31 October 1995 during the 28th session of the FAO Conference that was held in Rome between 20 October and 2 November 1995.[130] The *CCRF*,[131] which is a voluntary instrument, has a goal to develop principles for responsible fishing, in response to the pertinent rules of international laws, and support as a reference instrument to assist States to develop or improve the arrangements on legal, institutional and administrative frameworks that are needed for responsible and sustainable fishing. The *CCRF* applies to all types of fisheries, including fisheries within the national jurisdiction, as well as fisheries on the high seas. It is also applied through the process of fishing, which includes capture, post-harvest production and trade.[132]

As overcapacity is identified as a key issue in the *CCRF*, fishing capacity management is one of its main provisions. However, although the terms 'overfishing' or

[129] The Chairman of Negotiating Group on Rules produced a detailed and analytical report on the challenges faced in negotiations on fisheries subsidies in order to use it as a tool to frame future negotiations. See, ibid.

[130] FAO, *Code of Conduct for Responsible Fisheries* (1995) annex 1 para 24.

[131] The *CCRF* recognizes that fisheries, including catching, processing, marketing, and managing of fish stocks and aquaculture, give an significant food source, employment, and income for people all over the world. Thus, all people involved in fisheries have to conserve and manage the fisheries. See, FAO, *What is the Code of Conduct for Responsible Fisheries?* (FAO, 2001) 1.

[132] Ibid.

'overcapacity' are not specifically defined in the *CCRF*, there are references to related terms such as 'excessive fleet size' or 'excessive fishing effort'. The *CCRF* links overexploitation of the fish stock to the problem of excess capacity. The *CCRF* requires States to deter overfishing and excess capacity or eliminate excess capacity by applying effective management measures to ensure that the current level of fishing capacity is balanced with the potential capacity of the fisheries resources and their sustainable utilisation.[133] Such requirement means that States should not allow their fleet size and fishing effort to grow beyond levels, which are considered commensurate with sustainable use.[134] In this regard, MSY has been adopted as a limit reference point by the *CCRF*.[135] Thus, the level of fishing effort, which is suitable for the sustainable use of fisheries resources, is the level that can produce MSY. This requirement is applicable to all fisheries, independent of their exploitation status.[136] The *CCRF* also requires States to establish such management measures through suitable policy, legal and institutional frameworks, and based on the best scientific evidences currently available in order to achieve effective conservation and sustainable utilisation of fisheries resources.[137] Remarkable management measures for fishing capacity will be greatly discussed in Chapters 4 to 6.

Additionally, the *CCRF* establishes a further link between sustainability and economic factors, as article 7.2.2 suggests that 'Such measures should provide inter alia that: (a) excess fishing capacity is avoided and exploitation of the stocks remains economically viable; (b) the economic conditions under which fishing industries operate promote responsible fisheries.'[138] It means that the *CCRF* calls for measures aimed at avoiding the economic waste which overcapacity represents, and provides for both sustainability

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[133] *CCRF* art 6.3, 7.1.8.

[134] Cunningham and Greboval, above n 8, 7.

[135] FAO, 'Technical Consultation on the Measurement of Fishing Capacity: Mexico City, Mexico, 29 November-3 December 1999' (FAO Fisheries Report No. 615, FAO, 2000) 47.

[136] Cunningham and Greboval, above n 8, 7.

[137] The *CCRF* art 7.1.1 provides that 'States and all those engaged in fisheries management should, through an appropriate policy, legal and institutional framework, adopt measures for the long-term conservation and sustainable use of fisheries resources. Conservation and management measures, whether at local, national, subregional, or regional levels, should be based on the best scientific evidence available and be designed to ensure the long-term sustainability of fishery resources at levels which promote the objective of their optimum utilisation and maintain their availability for present and future generations; short-term considerations should not compromise these objectives.'

[138] *CCRF* art 7.2.2.

and economic viability.[139] In this sense, based on the viewpoints of economists, the maximum economic yield (MEY), which is the level of catch that provides the maximum net economic benefits or profits for a fishery as a whole,[140] could be set as a target reference point for such management objective.[141] MEY is usually less than MSY,[142] thus, theoretically, using MEY would conserve marine stocks better.

In terms of fishing vessel authorisation, the *CCRF* requires States to implement measures to ensure that none of fishing vessels are allowed to operate unless they are authorised in accordance with the international law for the high seas or with national law and regulations for the areas of national jurisdiction.[143] The *CCRF*, therefore, requires the authorisation for all fishing vessels including vessels operating within national jurisdictions and on the high seas, whereas the *Fish Stocks Agreement* requires States to authorise their fishing vessels only when operating on the high seas.[144] It results in empowerment of fishery administrations with control over national fishing fleets, which facilitates States to control their fishing capacity.

However, it should be noted that although the *CCRF* was promulgated since 1995, the overall compliance with the *CCRF* has not achieved the effective results,[145] particularly in many Asian States who contribute huge amounts to the fish production of the world,

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[139] Cunningham and Greboval, above n 8, 8.

[140] Chris Reid, 'An Analysis of Maximum Economic Yield in the Western Rock Lobster Fishery' (FISHERIES OCCASIONAL PUBLICATION No. 60, Department of Fisheries, Government of Western Australia, February 2009) <http://www.fish.wa.gov.au/Documents/occasional_publications/fop060.pdf>.

[141] Currently, MEY has been widely considered and adopted as a target or management reference point. For example, Australia by the Department of Agriculture, Fisheries and Forestry (DAFF) released the Commonwealth Fisheries Harvest Strategy: Policy and Guidelines in September 2007, which provide a framework for managing Commonwealth fisheries with an aim to maintain fish stocks, on average, at a target biomass equal to the stock size required to produce MEY. Therefore, in order to achieve this goal, the Australian Fisheries Management Authority (AFMA) is required to seek for harvest strategies that are able to maintain fish stocks at such level. See, Tom Compas, R Quentin Grafton and Nhu Che, 'Target and Path: Maximum Economic Yield in Fisheries Management' (July 2011) <http://adl.brs.gov.au/data/warehouse/pe_abares99010704/TR11.03MEYfish_hr.pdf>.

[142] This is referred to Gordon-Schaefer static model. See, Juan Carlos Seijo, Omar Defeo and Silvia Salas, *Fisheries Bioeconomics: Theory, Modelling and Management* (Rome, 1998).

[143] *CCRF* art 7.6.2.

[144] *Fish Stocks Agreement* art 18(2) indicates that 'A State shall authorize the use of vessels flying its flag for fishing on the high seas only where it is able to exercise effectively its responsibilities in respect of such vessels under the Convention and this Agreement.'

[145] The total of 53 States all over the world was evaluated. See, Tony J Pitcher, Daniela Kalikoski and Ganapathiraju Pramod (eds), *Evaluations of Compliance with the FAO (UN) Code of Conduct for Responsible Fisheries* (Fisheries Centre, University of British Columbia, 2006).

and their fisheries sector plays an essential role as a source of income and food for their nationals.[146] Particularly the compliance with the *CCRF* in terms of fishing capacity controls, New Zealand and Japan have been found as the only two States in the Asia Pacific region that have good performance.[147] An urgent action to control fishing capacity is therefore needed in this region. It is also important to note that although excess capacity is referred at various points in the *CCRF*, the *CCRF* does not provide States any explicit guidelines for fishing capacity management in order to prevent or eliminate excess capacity. Hence, in 1998 the FAO called for meetings to clarify issues that are related to excess fishing capacity and prepare such guidelines, and the International Plans of Action for Fishing Capacity Management was subsequently adopted in 1999.

3.2.2.2 The International Plans of Action for Fishing Capacity Management

The International Plans of Action for Fishing Capacity Management or *IPOA-Capacity*,[148] which was endorsed by the FAO Council in June 1999, is a voluntary instrument applies to all States[149] where their fishers involve with capture fisheries. It has been elaborated within the framework of Article 2(d),[150] as well as applied to the interpretation and application with the provisions of Article 3.1[151] of the *CCRF*.[152] The immediate objective of the *IPOA-Capacity* is for States and RFMOs to implement

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[146] Ibid.

[147] FAO APFIC, 'APFIC Regional Consultative Workshop Managing Fishing Capacity and IUU Fishing in the Asian Region, Phuket, Thailand, 13-15 June 2007' (RAP Publication2007/18, FAO/RAP, 13-15 June 2007 2007) <ftp://ftp.fao.org/docrep/fao/010/ah999e/ah999e00.pdf> 16.

[148] At its session in 1997, the Committee on Fisheries (COFI) requested FAO to address fishing capacity issue. A Technical Working Group on the Management of Fishing Capacity was therefore organised in La Jolla, USA during 15-18 April 1998. After that the FAO consultation was organised in Rome during 26-30 October 1998, followed by a preparatory meeting during 22-24 July 1998. In February 1999, the *IPOA-Capacity* was adopted by the 23rd session of COFI, after they were endorsed by the FAO Council in June 1999. See, *IPOA-Capacity* para 1.

[149] 'States' in the context of *IPOA-Capacity* include members and non-members of FAO, as well as fishing entities. See, *IPOA-Capacity* footnote 7.

[150] One of the objectives of the *CCRF* is to 'provide guidance which may be used where appropriate in the formulation and implementation of international agreements and other legal instruments, both binding and voluntary;' See, *CCRF* art 2(d).

[151] *CCRF* art 3.1 states that 'The Code is to be interpreted and applied in conformity with the relevant rules of international law, as reflected in the United Nations Convention on the Law of the Sea, 1982. Nothing in this Code prejudices the rights, jurisdiction and duties of States under international law as reflected in the Convention.'

[152] *IPOA-Capacity* para 4.

effective, equitable and transparent measures for fishing capacity management by 2003, and not later than 2005. It also requires States and RFMOs, who are faced with the problem of overcapacity that undermine the achievement of long-term sustainability outcomes, to firstly try to freeze fishing capacity at its current level and gradually decrease it, particularly the capacity of impacted fisheries.[153]

To achieve such objective, the *IPOA-Capacity* suggests a series of actions for States to take in managing their fishing capacity. These actions are fallen into four main strategies as follows:-

> '(i) the conduct of national, regional and global assessments of capacity and improvement of the capability for monitoring fishing capacity;[154]
>
> (ii) the preparation and implementation of national plans to effectively manage fishing capacity and of immediate actions for coastal fisheries requiring urgent measures;[155]
>
> (iii) the strengthening of regional fisheries organisations and related mechanisms for improved management of fishing capacity at regional and global levels;[156] and
>
> (iv) immediate actions for major transboundary, straddling, highly migratory and high seas fisheries requiring urgent measures.'[157]

The *IPOA-Capacity* further suggests that States may implement the four strategies aforementioned through mechanisms to promote this IPOA implementation, the establishment of awareness and education, the international technical cooperation and coordination.[158]

The *IPOA-Capacity* requires States to take urgent action to support in measurement[159] and assessment[160] of fishing capacity at national, regional and international levels. Therefore, States should establish appropriate and compatible standards for records of

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[153] *IPOA-Capacity* para 7. Put simply, the *IPOA-Capacity* aims to achieve a balance between fishing fleet size (inputs) and sustainable production (output).

[154] *IPOA-Capacity* part III, section I.

[155] *IPOA-Capacity* part III, section II.

[156] *IPOA-Capacity* part III, section III.

[157] *IPOA-Capacity* part III, section IV.

[158] *IPOA-Capacity* para 8.

[159] *IPOA-Capacity* paras 11-2.

[160] *IPOA-Capacity* paras 13-5.

national fishing vessels,[161] including their fishing vessels operating on the high seas.[162] States are further required to manage the fishing capacity of their fleets on the high seas, as well as ensure that they support multilateral co-operation to manage fishing capacity[163] and/or reduce overcapacity on the high seas.[164] Therefore, the *IPOA-Capacity* suggests States to appropriately cooperate through regional fisheries organisations or other arrangements of cooperation in order to ensure the effective management of fishing capacity.[165] States should also consider becoming parties of RFMOs or arrangements, or implement the conservation and management measures required by these organisations or arrangements on their fishing vessels.[166] Further, as many provisions under the *IPOA-Capacity* are in line with other international agreements, particularly the *FAO Compliance Agreement* and the *Fish Stocks Agreement*, States are then encouraged to consider participating in such international agreements as well.[167]

In terms of national plans of action for fishing capacity management (*NPOA-Capacity*), States are required to develop, implement and monitor such plans by taking into consideration the consequences of various resource management systems on fishing capacity.[168]

Additionally, the *IPOA-Capacity* suggests States, by concerning the needs of artisanal fisheries, to assess the possible impact of all factors, such as subsidies in fisheries, economic incentives and others, that directly or indirectly cause the accumulation of

[161] *IPOA-Capacity* para 16.

[162] *IPOA-Capacity* para 18. This provision supports what is provided under the *FAO Compliance Agreement* in particular.

[163] *IPOA-Capacity* para 33.

[164] *IPOA-Capacity* para 31. Specially, States should ensure that 'no transfer of capacity to the jurisdiction of another State should be carried out without the express consent and formal authorization of that State', as well as 'avoid approving the transfer of vessels flying their flag to high seas where such transfers are inconsistent with responsible fishing under the Code of Conduct.' See, *IPOA-Capacity* para 37-8.

[165] *IPOA-Capacity* para 27.

[166] *IPOA-Capacity* para 34.

[167] *IPOA-Capacity* para 29.

[168] *IPOA-Capacity* para 19. Thus, 'States should develop, adopt and make public, by the end of 2002, national plans for the management of fishing capacity and, if required, reduce fishing capacity in order to balance fishing capacity with available resources on a sustainable basis and review such plans at least every four years. See, *IPOA-Capacity* para 21, 24.

excessive fishing capacity that weakens the sustainability of marine living resources.[169] These subsidies are, for instance, subsidies for building new vessels, fishing gears, fuel, and infrastructure. The adoption of the *IPOA-Capacity* has then resulted in increased attention toward the issue of subsidies and their impact on sustainability and trade.[170] FAO, therefore, organised a consultation of experts on economic incentives and responsible fisheries in 2000 in order to assess the state of knowledge of fisheries subsidies and their likely effect on trade and resource sustainability.[171] The experts categorised the subsidies based on their effects into three groups, including i) revenue-enhancing group; ii) cost-reducing group; and iii) miscellaneous/unspecified group.[172]It was recommended that more accurate information on the number and value of such three groups of subsidies is needed before proceeding quantitative work. The empirical knowledge about the impacts of subsidies on trade in fish and fishery products is also needed to collect.[173] In this respect, the Committee on Trade and Environment of the World Trade Organisation has addressed the issue, with special reference to fisheries.[174] Currently, the decision over how to use of subsidies in fisheries rests ultimately with State governments that are engaged in related negotiations in the WTO.[175]

However, it can be clearly seen that most of States were not able to achieve the timeframe for such immediate objective set by the *IPOA-Capacity*, as of 2015, there are only three States, namely the United States, Namibia, and Indonesia, have officially adopted the *NPOA-Capacity*,[176] and only two Regional Plans of Action for the Management of Fishing Capacity are established, i.e., Lake Victoria Fisheries Organisation (LVFO) Regional Plan of Action for the Management of Fishing Capacity in Lake Victoria and Inter-American Tropical Tuna Commission (IATTC) Regional

[169] *IPOA-Capacity* paras 25-6.

[170] Cunningham and Greboval, above n 8, 11.

[171] This expert consultation was held at FAO Headquarters in Rome, Italy on 28 November-1 December 2000. See, FAO, 'Report of the Expert Consultation on Economic Incentives and Responsible Fisheries: Rome, Italy, 28 November-1 December 2000' (FAO Fisheries Report. No. 638, FAO, 28 November-1 December 2000 2000) <http://www.fao.org/docrep/012/x9143e/x9143e00.pdf> 24.

[172] Ibid iv.

[173] Ibid 12.

[174] Cunningham and Greboval, above n 8, 11.

[175] Details are discussed under section 3.2.1.4 of this chapter.

[176] The United States have adopted the NPOA-Capacity in 2004, whereas Namibia and Indonesia have adopted the *NPOA-Capacity* in 2007 and 2008, respectively. See, FAO, *National Plans of Action for the Management of Fishing Capacity* (2015) <http://www.fao.org/fishery/ipoa-capacity/npoa/en>.

Plan of Action for the Management of Fishing Capacity.[177] The difficulties in achieving this immediate objective could be based on the fact that other timeframes set within the *IPOA-Capacity* were hardly achieved by most of States. Such timeframes were, for instance, States should assess the national fishing capacity in terms of all fishing fleets of important fisheries and should periodically reanalyse the capacity assessment by the end of 2000;[178] States should systematically identify the fisheries and fishing fleets that require urgent measures, and review this determination periodically by the end of 2001;[179] and States should develop, adopt and make public the *NPOA-Capacity* and, if it is necessary, decrease fishing capacity in order to sustainably limit fishing capacity at a commensurate level with existing resources the end of 2002.[180]

It should also be noted that fishing capacity and overcapacity have themselves remained relatively uncertain concepts throughout the preparation of this IPOA, as well as of the *CCRF*,[181] which may cause difficulty in interpreting the instruments. More importantly, although the *IPOA-Capacity* systematically addresses the issues related to fishing capacity management, it does not provide specific measures on how to implement its many provisions, particularly in measurement, assessment and management of fishing capacity either in national waters or on the high seas. Therefore, such technical measures used to manage fishing capacity are identified and discussed in succeeding chapters.

3.3 Legislative Framework for Fishing Capacity Management at Regional Level

The use of a regional framework on fishing capacity is necessary at the regional level in order to establish a collaborative approach to address a common problem. Additionally, the States directly involved can define priorities that reflect the regional issues, environmental/geographic conditions, and socio-economic circumstances.[182] Concerns

[177] FAO, *Regional Plans of Action for the Management of Fishing Capacity* (2015) <http://www.fao.org/fishery/ipoa-capacity/rpoa/en>.

[178] *IPOA-Capacity* para 13.

[179] *IPOA-Capacity* para 14.

[180] *IPOA-Capacity* para 21.

[181] Cunningham and Greboval, above n 8, 10-1.

[182] Lee K Kimball, *International Ocean Governance: Using International Law and Organisations to Manage Marine Resources Sustainably* (IUCN, 2003) 51.

on fishing capacity issue may also be more successfully addressed through sound institutional arrangement. In the Southeast Asian and Indian Ocean regions, where Thailand is located, a number of institutional arrangements have been established to address fisheries problems, including overcapacity. The significant arrangements include Conservation and Management of the IOTC, SEAFDEC Regional Code of Conduct for Responsible Fisheries, and the Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region. The first instrument is legally binding, whereas the rest is more voluntary.

3.3.1 Conservation and Management Measures of the Indian Ocean Tuna Commission

As States are required to cooperate through subregional or regional fisheries organisations in the conservation and management of the living resources, therefore there are 51 regional fishery bodies (RFBs)[183] established worldwide, 21 of which are RFMOs.[184] For the competence on the high seas in particular, there are 27 of existing fisheries organisations, 17 of them are RFMOs.[185] These RFMOs established by area[186] or for species[187] have regulatory powers for conservation and management, subject to

[183] Regional Fishery Bodies (RFBs) are 'a mechanism through which States or organisations that are parties to an international fishery agreement or arrangement (agreement is fundamental, and different from arrangement) work together towards the conservation, management and/or development of fisheries.' Some RFBs, especially those with an ecosystem mandate, work with seabirds etc. that are connected with fisheries but are not fish stocks per se. The mandates of RFBs vary. Some RFBs have an advisory mandate, so that they provide advice, decisions or coordinating mechanisms, which are not binding on their parties. Some RFBs, on the other hand, have a mandate on management. These organisations are called Regional Fisheries Management Organisations (RFMOs). They adopt the measures on fisheries conservation and management, which are binding on their parties. See, FAO Fisheries and Aquaculture Department, *Regional Fishery Bodies (RFB) - Web Site. What are Regional Fishery Bodies (RFBs)?* (17 October 2013) FAO <http://www.fao.org/fishery/topic/16800/en>.

[184] FAO, *Search Fishery Governance Fact Sheets* (2015) FAO <http://www.fao.org/fishery/rfb/search/en>.

[185] Ibid.

[186] RFMOs in this group include the Western and Central Pacific Fisheries Commission (WCPFC), Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR), North East Atlantic Fisheries Commission (NEAFC), Southeast Atlantic Fisheries Organisation (SEAFO), Northwest Atlantic Fisheries Organisation (NAFO), and South Indian Ocean Fisheries Agreement (SIOFA).

[187] RFMOs in this group include Inter-American Tropical Tuna Commission (IATTC), International Commission for the Conservation of Atlantic Tunas (ICCAT), International Pacific Halibut Commission (IPHC), International Whaling Commission (IWC), North Pacific Anadromous Fish Commission (NPAFC), Indian Ocean Tuna Commission (IOTC), Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP), Commission for the Conservation of Southern Bluefin Tuna (CCSBT), and North Atlantic Salmon Conservation Organisation (NASCO).

certain procedures. The Indian Ocean Tuna Commission (IOTC)[188] is one of the RFMOs established by concerning the species managed.

The IOTC is an intergovernmental organisation, which is established under Article XIV of the FAO Constitution. It was adopted at the 105th session of the FAO Council held in Rome on 25 November 1993. The IOTC Agreement[189] entered into force on 27 March 1996 due to the accession of the 10th member.[190] The mandate of the IOTC is to manage tuna and tuna-like species[191] in the Indian Ocean and adjacent sea areas. The main objective of this organisation establishment is to promote cooperation among its parties in order to assure the conservation and optimum utilisation of concerned stocks through suitable management and encourage the development of sustainable fisheries of these stocks.[192] For the objective to conserve and manage the stocks migrating into or out of the Indian Ocean, the area of competence of the IOTC covers the FAO statistical areas 51 and 57 and adjacent seas.[193] As of 5 June 2014, the IOTC has 32 member States and three Cooperating Non-Contracting parties.[194] Thailand has been an IOTC member State since 17 March 1997.[195]

To achieve the aforementioned objectives, the functions and responsibilities of the IOTC are in line with the principles revealed in the applicable provisions of the *LOSC*[196] that States should regularly review the status and trends of the stocks and collect, analyse and circulate scientific information, catch and fishing effort data and other required data for the conservation and management of concerned stocks and their

[188] Hereinafter referred to as 'the Commission' too.

[189] The *IOTC Agreement*, hereinafter also referred to as 'the Agreement'.

[190] IOTC, *IOTC - Basic Texts* (2015) <http://www.iotc.org/about-iotc/basic-texts>.

[191] The species under the management mandate of IOTC are, for instance, yellowfin tuna, skipjack, bigeye tuna, albacore tuna, and Southern bluefin tuna, longtail tuna, Kawakawa, frigate tuna etc. See, IOTC, *Competence: Area & Species* (2015) <http://www.iotc.org/about-iotc/competence>.

[192] *IOTC Agreement* art V(1).

[193] *IOTC Agreement* art II.

[194] IOTC, *Structure of the Commission: Commission Contracting Parties (Members)* (2015) <http://www.iotc.org/about-iotc/structure-commission>.

[195] IOTC, 'Report of the Eighteenth Session of the Indian Ocean Tuna Commission' (IOTC–2014–S18–R[E], IOTC, 1-5 June 2014) <http://www.iotc.org/documents/report-eighteenth-session-indian-ocean-tuna-commission> 4.

[196] IOTC, *The Commission: Objectives, Function and Responsibilities, and IOTC Performance Monitoring* (2015) IOTC <http://www.iotc.org/about-iotc>.

fisheries;[197] encourage, suggest, and coordinate research and development activities with regard to concerned stocks and their fisheries, and other activities as appropriate and feasible, including activities related to technology transfer, training and improvement. These activities must be carried out by concerning the equitable participation of IOTC's parties in the fisheries and the special interests and needs of those who are developing States.[198] Additionally, the IOTC is responsible to adopt the conservation and management measures based on scientific evidences, in order to make certain of the conservation of the concerned stocks and to promote the objective of optimum utilisation of these stocks in the area of competence;[199] and to regularly review the economic and social perspectives of concerned stocks' fisheries, taking into account developing coastal States' interests in particular.[200] In each session, the Commission takes decisions on the management of tuna and tuna-like species covered by the Agreement. Unless some members particularly object, such decisions are agreed and passed in a form of IOTC resolutions that are binding on all parties. Recommendations, on the other hand, are slightly different in that they are adopted on voluntary basis, not binding the members.[201]

The Agreement also requires the establishment of a permanent scientific committee.[202]The scientific committee was formally created at the first session of the Commission.[203] This committee advises the Commission and sub-commissions on research and data collection, on the condition of stocks, and on issues of stock management. The meetings of the scientific committee are held conjointly with those of the Commission.[204] In addition, if it is necessary, the IOTC may establish working

[197] *IOTC Agreement* art V(2)(a).

[198] *IOTC Agreement* art V(2)(b).

[199] *IOTC Agreement* art V(2)(c).

[200] *IOTC Agreement* art V(2)(d).

[201] IOTC, *Conservation and Management Measures (CMMS)* (2015) IOTC <http://www.iotc.org/cmms>.

[202] *IOTC Agreement* art XII(1).

[203] The first session of the IOTC was held in Rome, Italy on 3-6 December 1996. At that meeting, the Commission decided to establish a scientific committee pursuant to Article XII(1) of the Agreement and assigned functions, composition, operation, as well as financial responsibilities. The Commission decided that it was premature to create sub-commissions. Seychelles was also selected to host the secretariat of the Commission. See, IOTC, 'Report of the First Session of the Indian Ocean Tuna Commission' (FAO Fisheries Report No. 551, IOTC, 3-6 December 1996) <file:///C:/Users/pk207/Downloads/IOTC-1996-S01-R[EN+FR].pdf>.

[204] IOTC, *Structure of the Commission* (2015) IOTC <http://www.iotc.org/about-iotc/structure-commission>. The working party on fishing capacity

parties as subsidiary bodies for specific purposes of the Agreement.[205] The most common objective is to provide the scientific committee with analyses of the situation of the stocks as well as an assessment of possible management actions.[206] Currently, the IOTC has eight working parties, including the working party on fishing capacity (WPFC).[207]

Establishment of the WPFC is necessary due to the fact that the Commission has requested the information on fishing capacity employed in the area of competence of IOTC in order to make decisions on stock management. The first WPFC was established in the 2009 session of the IOTC[208] and has been required to determine the level of fishing capacity and provide necessary information that will enable the IOTC to effectively implement the capacity controls. The WPFC is expected to undertake the tasks including: (i) review methods used to estimate and manage fishing capacity that have been reviewed by the FAO Technical Advisory Committee on Tuna Fishing Capacity, other RFMOs, national management organisations, and other institutions; (ii) examine the most appropriate methods that can be used to assess fishing capacity in the Indian Ocean, as well as additionally review any further data requirements to use such methods in IOTC; (iii) identify the factors that affect the fishing capacity and can be managed by the IOTC; (iv) determine existing fishing capacity of tuna fishing fleets concerning the state of tuna and tuna-like resources; and (v) determine the fishing capacity level of different groups of fishing vessels and gears.[209]

In terms of IOTC Resolutions, due to the recognition by member States that excess capacity in the Indian Ocean has probably existed, the IOTC resolutions, therefore, call

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[205] *IOTC Agreement* art XII(5).

[206] Some working parties, such as the working party on tagging or the working party on data collection and statistics, are established with the purpose of analysing and producing recommendations on a specific technical problem. The working parties are constituted by scientists attending in their individual capacity and they do not represent any particular member or non-member countries. Their meetings are open to all interested parties with expertise in the relevant issues under the working party consideration. See, IOTC, *Working Parties* (13 January 2011) IOTC <http://www.iotc.org/English/meetings/wp/allwp.php>.

[207] IOTC, 'Report of the Seventeenth Session of the IOTC Scientific Committee' (IOTC-2014-SC17-R[E], IOTC, 8-12 December 2014) <http://www.iotc.org/documents/report-17th-session-iotc-scientific-committee> 88.

[208] IOTC, 'Report of the 1st Session of the IOTC Working Party on Fishing Capacity' (IOTC-2009-WPFC-R[E], 22 October 2009) <http://www.iotc.org/documents/report-1st-session-iotc-working-party-fishing-capacity-0> 3.

[209] IOTC, *About the Working Party on Fishing Capacity (WPFC)* (13 October) IOTC <http://www.iotc.org/English/meetings/wp/wpfccurrent.php>.

for States to limit fishing capacity at certain levels pertaining to particular years.[210] The significant resolutions include Resolution 03/01,[211] Resolution 06/05,[212] Resolution 07/05,[213] Resolution 09/02,[214] and Resolution 12/11.[215] However, only Resolution 03/01 on the limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties (CPCs)[216] and Resolution 12/11 on the implementation of a limitation of fishing capacity of CPCs are currently active.[217]

In particular, Resolution 12/11 recognises the importance of the appropriate implementation of the resolutions concerning fishing capacity management (e.g., Resolution 03/01) in order to stabilise the fishing capacity level employed on high economic value stocks within the area of competence of the IOTC, and to facilitate the tasks of the scientific committee to enable to provide the Commission with scientific advices. It also requires CPCs to submit the IOTC Secretariat the lists of vessels, by gear type, over 24 metres overall length and under 24 metres if they fish outside their national EEZs by 31 December 2009. This requirement applies to vessels fishing for tropical tunas during the year 2006 and for swordfish and albacore during the year 2007. Further, within the period of application of this resolution during the years 2010 and 2011, if CPCs change the number of their vessels, CPCs are required to demonstrate to the Commission that the modification of the number of vessels, by gear type will not create an increase of fishing effort on the fish stocks involved. However, for other CPCs who have had the purpose to develop their fishing fleets and submit the IOTC a fleet

[210] IOTC, above n 208, 3.

[211] Resolution 03/01 on the Implementation of Limitation of Fishing Capacity of Contracting Parties and Cooperation Non-Contracting Parties.

[212] Resolution 06/05 on the Limitation of Fishing Capacity, in Terms of Number of Vessels, of IOTC Contracting Parties and Cooperating Non-Contracting Parties. This resolution has been superseded by Resolution 09/02. See, IOTC, 'Compendium of Active Conservation and Management Measures for the Indian Ocean Tuna Commission' (8 October 2014) <http://www.iotc.org/cmms>.

[213] Resolution 07/05 on the Limitation of Fishing Capacity of IOTC Contracting Parties and Cooperating Non-Contracting Parties in Terms of Number of Longline Vessels Targeting Swordfish and Albacore. This resolution has been superseded by Resolution 09/02. See, ibid.

[214] Resolution 09/02 on the Implementation of a Limitation of Fishing Capacity of Contracting Parties and Cooperation Non-Contracting Parties. This resolution has been superseded by Resolution 12/11. See, ibid.

[215] Resolution 12/11 on the Implementation of Limitation of Fishing Capacity of Contracting Parties and Cooperation Non-Contracting Parties.

[216] Resolution 03/01 requires CPCs, which have more than 50 vessels on the 2003 IOTC record of vessels, to limit, in 2004 and following years, the number of their fishing vessels larger than 24 metres length overall to the number of its fishing vessels registered in 2003 in the IOTC record of vessels.

[217] It is as of 8 October 2014. See, IOTC, above n 212.

development plan in accordance with the provisions of IOTC Resolution 03/01, they are required to confirm the type, size, gear and origin of the vessels indicated in the fleet development plans and the programming to the Commission by 31 December 2009. The IOTC Compliance Commission will verify the implementation, in accordance with the notified programming, of such fleet development plans. This Resolution is applicable during 2012 and 2013, and the implication of these plans is reviewed at the 2014 IOTC Session.[218] So far, many CPCs have introduced their fleet development plans including Thailand.

Additionally, for the estimates of fishing capacity in the IOTC area to be useful in a management context, the information required should include detailed information on the fleets for which fishing capacity is to be estimated, in particular vessel unique identification, vessel length and gross tonnage, levels of activity and gear used for each individual vessel in the fleets under consideration, and target species.[219] Due to the importance of aforesaid information, the IOTC requires all CPCs with vessels fishing for tunas and swordfish in the area of competence of IOTC to submit a list of their respective vessels that were active in such area during the previous year to the IOTC secretary by 15 February every year. The respective vessels are larger than 24 metres in length overall or less than 24 metres and operating in waters outside the EEZ of the flag State. The information of each vessel, such as the IOTC number, name and registration number, type, length, and gross tonnage of vessel, name and address of owner or operator, main target species and period of authorisation, must be included in the list submitted.[220] Also, CPCs are required to provide the estimates of the total annual catch by species and gear for all species covered by the mandate of the IOTC, as well as annual catch weight by species and effort data of previous year from all types of tuna fisheries in the IOTC area (i.e., surface fisheries, longline fisheries, coastal fisheries).[221]

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[218] The Commission agreed to extend the applicability of Resolution 09/02 for an additional two years period. Thus, Resolution 12/11 has been issued to supersede Resolution 09/02. See, ibid.

[219] IOTC, above n 208.

[220] IOTC, 'Report of the Fourteenth Session of the Indian Ocean Tuna Commission' (IOTC-2010-S14-R[E], IOTC, 1-5 March 2010) <http://www.iotc.org/files/proceedings/2010/s/IOTC-2010-S14-R[E].pdf> 85.

[221] According to the timeliness of data submission to the IOTC Secretariat, longline fleets operating on the high seas will provide provisional data for the previous year no later than 30 June. Final data will be submitted no later than 30 December, and all other fleets (including supply vessels) will submit their final data for the previous year no later than 30 June. See, Resolution 10/02 Mandatory Statistical Requirements for IOTC Members and Cooperation Non-Contracting Parties (CPC's).

However, based on the discussions at the First Session of the IOTC WPFC,[222] it was agreed that in order to understand the actual fishing pressure directed at tuna resources, estimates of fishing capacity should include the fishing vessels under 24 metres operating exclusively inside the EEZ of participating States,[223] particularly the catches of these fleets are already included in the IOTC database.[224] Furthermore, it has been found that fishing capacity of vessels between 15-24 metres (length overall) in the Indian Ocean has substantially increased in recent years.[225] To address this issue, the Scientific Committee recommended that the Commission should extend requirements for the vessels in IOTC Resolution 10/02 to equally apply to all of the authorized vessels.[226]

The use of only two vessel-length categories to assess input capacity, less than 24 metres and 24 metres or greater, may be insufficient. Therefore, the WPFC recommended that narrower vessel length categories should be used for assessment of future estimates of input capacity.[227] Nonetheless, it is important to note that multi-species fisheries operated by these fleets may make the estimates of tuna-directed capacity very difficult to assess. Systematic records of catches by species from such vessels at local levels are then essential. Moreover, although input-based measures of fishing capacity has been suggested because they are more practical for management purposes, such measures should be further developed in terms of the methods to relate fishing mortality levels and the effective effort measures, which will be helpful for giving advice with regard to fishing capacity limits.[228]

The measures for vessels over 24 metres overall length and under 24 metres if they operate beyond their EEZs would make it difficult for an IUU vessel to operate in the IOTC area, but such measures unlikely create a reduction of vessels authorised to fish in

[222] The First Session of the IOTC WPFC was held at Mombasa, Kenya on 22 October 2009.

[223] This only refers to inboard powered fishing vessels. See, IOTC, above n 208, footnote 7.

[224] Ibid para 31.

[225] Vessels of this size that operate within the EEZ of coastal countries are not required to provide catch-and-effort and size data as per the same resolution as vessels in the IOTC Record of Authorized vessels. See, IOTC Secretariat, 'Summary: Estimation of Fishing Capacity by Tuna Fishing Fleets in the Indian Ocean' (IOTC–2013–SC16–19[E], 14 November 2013) <http://www.iotc.org/documents/summary-estimation-fishing-capacity-tuna-fishing-fleets-indian-ocean>.

[226] Ibid.

[227] IOTC, above n 208, para 32.

[228] Ibid para 37.

the Indian Ocean.[229] Furthermore, apart from the nature of multi-species fisheries of tuna fleets, other complexities, such as the increase in fishing power, shifting targeting practices, could also be an obstacle in obtaining accurate information needed for the estimation of optimal fishing capacity. Due to these constraints, the WPFC has been unable to provide optimal levels of fishing capacity as requested by the Commission yet.[230] As there has been no new document presented since 2010,[231] the WPFC was consequently amalgamated into the Working Party on Tropical Tunas as a theme session.[232] This clearly undermines the effectiveness of a management tool applied.

Moreover, based on a performance review of the IOTC conducted in 2009, it was found that the IOTC Agreement is not up to date as it does not contain modern principles for fisheries resource management, such as the precautionary approach[233] and the ecosystem-based approach,[234] that can be helpful in managing fishing capacity in their area of competence. In addressing this issue, the Commission adopted the conservation and management measure on the implementation of the precautionary approach[235] that is in line with relevant internationally agreed standards, particularly with the *Fish Stocks Agreement*. The reference point and harvest control rules used for this approach will be supplied by the SC.

The performance review also showed that the quantitative data of many stocks that are covered by the IOTC mandate is quite limited due to an inadequacy of compliance, a large amount of catches being harvested by artisanal fisheries, which small data and information is available, and cooperation of non-member countries of the IOTC is inadequate. Additionally, several developing States have had serious constraints in

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[229] Joseph et al, above n 61, 16.

[230] IOTC, above n 208, 8.

[231] Some member countries have not provided all the data required by the Commission, causing difficulties for the WPFC to achieve their tasks assigned.

[232] A review and compliance to Resolution 12/11 on fishing capacity resolution will be included in the second performance review of the IOTC. See, IOTC, above n 195, appendix XV.

[233] IOTC, 'Report of the IOTC Performance Review Panel' (January 2009) <http://www.iotc.org/files/misc/performance%20review/IOTC-2009-PRP-R%5BE%5D.pdf> Recommendation 37.

[234] Ibid Recommendation 10.

[235] Resolution 12/01 on the Implementation of the Precautionary Approach. Some elements of precautionary approach, i.e., interim target and limit reference points for albacore, bigeye tuna, skipjack tuna, yellowfin tuna and swordfish, were also adopted. See, Resolution 13/10 on Interim Target and Limit Reference Point and a Decision Framework.

terms of their national capacity and/or infrastructure, which obstruct their capability to comply with binding obligation, particularly regarding collecting, reporting and processing data.[236] As a response to these shortcomings, the IOTC has adopted a number of resolutions, for instance, Resolution 10/07,[237] 10/08,[238] 10/09,[239] and 11/04,[240] as well as established projects related to capacity building in data collection and reporting for developing country CPCs.[241] However, the urgent actions are still required to improve the performance of the ITOC, particularly application of methods for scientific assessment (based on the data and information available) for the optimal fishing capacity and TACs. Strengthening the capability of the compliance committee to effectively monitor non-compliance and developing sanction mechanisms for non-compliance are also needed.[242]

3.3.2 SEAFDEC Regional Code of Conduct for Responsible Fisheries

Since the adoption of the *CCRF* by FAO members in 1995, SEAFDEC has supported the *CCRF* implementation and upheld the general principles and standards given, with the effort to initiate a comprehensive program known as the Regionalisation of the *CCRF*,[243] which covers a wide range of fisheries sectors such as fishing technology and practices, aquaculture, post-harvest technology and trade and fisheries management. The original framework of the program on the Regionalisation of the *CCRF* in

[236] IOTC, above n 233.

[237] Resolution 10/07 Concerning a Record of Licensed Foreign Vessels Fishing for Tunas and Swordfish in the IOTC Area.

[238] Resolution 10/08 Concerning a Record of Active Vessels Fishing for Tunas and Swordfish in the IOTC Area.

[239] Resolution 10/09 Concerning the Functions of the Compliance Committee.

[240] Resolution 11/04 on A Regional Observer Scheme.

[241] IOTC, above n 195, appendix XV.

[242] In fact, there have been concerns in failing to adopt management measures even with best scientific advice available. The notable concern has been on the slow process in addressing matters such as the establishment of equitable and transparent allocation procedures, capacity control and management based on scientific advice. This failure is bringing the role and work of RFMOs into disrepute and jeopardizing their credibility. On this matter, there was criticism by Pacific Island parties and civil society in December 2007 concerning the failure of the Western and Central Pacific Fisheries Commission (WCPFC) to reach the management decisions on bigeye and yellowfin stocks. This situation has led to a souring of relations between Pacific Island States and the distant-water fishing nations that are members of the WCPFC. See, FAO Fisheries and Aquaculture Department, above n 7, 71.

[243] The Regionalization of the *CCRF* has been implemented by SEAFDEC since 1998 with the support from the Japanese Trust Fund. See, SEAFDEC, *SEAFDEC in Support of CCRF in Southeast Asia* (2010) SEAFDEC <http://www.seafdec.org/cms/index.php?view=article&id=74%3Aseafdec-in-support-of-ccrf-in-southeast-asia&option=com_content&Itemid=63>.

Southeast Asia covers two components: (i) mainstreaming the Regional Guidelines,[244] and (ii) capacity building for the implementation of the *CCRF* in the Region. The Regional *CCRF* is used by Member States as a framework for the promotion of responsible fisheries. Subsequently, the Member States are requested to make full use of the Regional Guidelines on the *CCRF* in Southeast Asia as a guiding principle, and for States to continue to promote the implementation of the *CCRF* at the national level.[245] These regional guidelines have been recognised by the ASEAN States as important tools in bridging the gaps between internationally adopted initiatives and the actual implementation of the *CCRF* at the national and local levels.[246]

The Regional *CCRF*, which was prepared on the basis of FAO *CCRF*, provides measures to address fishing capacity issues.[247] Mainly, it suggests States to deter the accumulation of excess fishing capacity where fisheries resources are still under-exploited. Where overcapacity exists, States are suggested to establish mechanisms to eliminate overcapacity in order to make certain of the sustainable utilisation of fisheries resources. Suggested steps are: (a) implementing an enhanced system of local and national registration of fishing vessels; (b) limiting the number of fishing vessels at current levels; (c) decreasing the number of vessels, at the proper rate respecting socio-economic impacts, by implementing measures, such as buyback scheme, reallocating of fishing vessels, alternative careers in other economic sectors with the support from subsidy programs; (d) continuously monitoring the impact of vessel reduction on the fisheries resources, and preventing any new applicants to the overexploited fisheries; (e) providing training on alternative occupational skills to fishers engaged in over-exploited fisheries and encourage them to leave such fisheries; and (f) developing and using

[244] The four Regional Guidelines for Responsible Fisheries (Fishing Operations, Aquaculture, Fisheries Management, and Post-harvest Practices and Trade), were published from 2000 to 2005, and the Supplementary Guidelines (Co-Management Using Group User Rights, Fishery Statistics, Indicators, and Fisheries Refugia) were published in 2006. See, ibid.

[245] Southeast Asian Fisheries Development Center, 'Promotional and Following Up Program on the Implementation of the Code of Conduct for Responsible Fisheries in Southeast Asia' (SEAFDEC/C09/WP6, Southeast Asian Fisheries Development Center, 7-10 April 2009) <http://www.seafdec.org/cms/index.php?option=com_content&view=article&id=129:41th-meeting-of-the-seafdec-council&catid=38:news&Itemid=63> 1.

[246] FAO, 'Report of the Thirtieth Session of the Asia-Pacific Fishery Commission' (RAP Publication 2008/11, 11-13 August 2008) <ftp://ftp.fao.org/docrep/fao/011/i0327e/i0327e00.pdf> 41.

[247] SEAFDEC, 'Regional Guidelines for Responsible Fisheries in Southeast Asia Fisheries Management' (MFRDMD/SP/3, April 2003) <http://www.seafdec.org.ph/pdf/Responsible_Fisheries_Management_MFRDMD.pdf> 19.

proper indicators for the management of fishing capacity.[248] Based on the uncertainty of the condition of fisheries resources, States should also adopt a precautionary approach for fishing capacity management.[249] Furthermore, States should develop a NPOA through a consultation process with relevant stakeholders, taking into consideration the specific issues and types of fisheries in the region, as well as consider the applicable issues suggested by the *IPOA-Capacity*.[250]

SEAFDEC has further conducted initiatives on fishing capacity management by organising five consultations and meetings on this issue under the Sida-SEAFDEC Collaborative Project.[251] The first meeting aimed to introduce the *IPOA-Capacity*[252] and to identify related opportunities and constraints, as well as actions required for fishing capacity management in Southeast Asia.[253] The second one aimed to discuss the practical steps towards development and promotion of Human Resources Development (HDR) activities for fishing capacity management in the region.[254] The next two meetings focused on the identification of problem areas, possibilities and target groups for various HDR interventions to alleviate problems caused by excess fishing capacity.[255] The fifth meeting was consultation organised as the project-end meeting of Sida-SEAFDEC Project and had objectives to review and conclude majors outputs from the project, to review other relevant initiatives together with the experiences and lessons

[248] Ibid 19-20.

[249] Ibid 21.

[250] Ibid 20.

[251] Swedish International Development Cooperation Agency (Sida) by the Swedish Board of Fisheries (SBF) has supported the ASEAN member States in facilitating programs/activities related to fisheries management for sustainable fisheries achievement through this project during the period 2003-2006 for first phase. This project conducted various activities, such as the preparation of training materials using the Regionalization of the *CCRF*, organizing Regional Technical Consultations related to fisheries human resource development and management of fishing capacity, and collecting regional information on the fisheries management and management of fishing capacity. See, SEAFDEC, 'Report of the Regional Technical Consultation on Management of Fishing Capacity and Human Resources Development in Support of Fisheries Management in Southeast Asia' (SEC/SP/86, 19-22 September 2006) 38-9.

[252] SEAFDEC in collaboration with FAO organized a Regional Workshop on the Excess Fishing Capacity held in Malaysia in November 2000. See, ibid 6.

[253] Judith Swan, 'Summary Information on the Role of International Fishery Organisations or Arrangements and other Bodies Concerned with the Conservation and Management of Living Aquatic Resources' (FIPL/C985, FAO, 2003) <http://www.fao.org/docrep/005/y4455e/y4455e00.htm#Contents> 47.

[254] The ASEAN-SEAFDEC Regional Technical Consultation on HDR in Fisheries Management was held in Cambodia on 3-6 June 2004. See, SEAFDEC, above n 251, 7.

[255] The two meetings were the Preparatory Expert Meeting on Fishing Capacity and Related HRD Needs in the ASEAN Region held on 14-16 September 2004 in Thailand and the Expert Meeting on Management of Fishing Capacity in Southeast Asia held on 27-29 July 2006 in Cambodia. See, ibid.

learned for coastal fisheries and resources management and fishing capacity management in Southeast Asia, as well as to identify future direction, works, from SEAFDEC and relevant initiatives in managing fisheries, particularly fishing capacity in the region.[256] Although the management measures concluded from these five consultations and meetings on approaches and direction towards management of excess fishing capacity were generally in line with the Regional *CCRF* aforementioned, there were some specific measures suggested to manage fishing capacity. Such management measures are, for example, to limit access regime of fisheries, to promote co-management and rights-based fisheries, to limit catch and fishing effort, to ban the use of certain fishing gears, to promote and harmonise action plans through good governance, and to exchange information and share experiences through policy dialogues, networking and partnership.[257] However, means to implement these measures are not provided.

In addition, the future regional collaboration in fisheries management by five sub-regional management areas has been proposed as well. The five areas include the Gulf of Thailand,[258] the Malacca Strait and Andaman Sea, the South China Sea, Sulu Sea or Celebes Sea, and Mekong River.[259] Some of these areas, e.g., the Gulf of Thailand, were later overlapped with the areas covered by the Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region (*RPOA*).[260] In order to promote the sub-regional arrangements, SEAFDEC has organised meetings in the context of fisheries management on the Gulf of Thailand area in 2008 and 2009.[261] This initiative was pointed out by the *RPOA* Coordinating

[256] The Regional Technical Consultation on Management of Fishing Capacity and Human Resource Development in Support of Fisheries Management in Southeast Asia was held on 19-22 September 2006 in Thailand. See, ibid 8.

[257] Ibid 10-1.

[258] In this context, the area of the Gulf of Thailand covers sub-areas within the FAO fishing area 71. See, FAO, *FAO Major Fishing Areas: Pacific, Western Central (Major Fishing Area 71)* FAO <http://www.fao.org/fishery/area/Area71/en>. These sub-areas are composed: (i) sub-area 71 a: marine fishing area of Thailand (the Gulf of Thailand); (ii) sub-area 71 b: marine fishing area of Cambodia; (iii) sub-area 71 c: marine fishing area of Vietnam (Southwest Vietnam); and (iv) sub-area 71 e: marine fishing area of Malaysia (East coast of Peninsular Malaysia). See, SEAFDEC, above n 251, 2.

[259] SEAFDEC, above n 251, 12.

[260] This instrument is discussed in next section.

[261] The first sub-regional meeting on the Gulf of Thailand was held on 24-26 March 2008 and the second meeting was held on 24-26 February 2009. Both meetings were held in Bangkok, Thailand. See, SEAFDEC, 'Programs under the ASEAN-SEAFDEC FCG Mechanism: Support to the Implementation of the Code of Conduct for Responsible Fisheries' (SEAFDEC/PCM32/WP03a-i, SEAFDEC, 16-18

Committee in April 2008 as a case that could be studied by other sub-regions.[262] As a response to this suggestion, SEAFDEC, with the support of Sida, organised the first meeting of the Andaman Sea sub-region in 2009, which aimed to propose the options for strengthening capacity and improving system to monitor record and control active fishing effort around the Andaman Sea area.[263]

After the first phase of Sida-SEAFDEC Project, SEAFDEC has continued to initiate various activities concerning fishing capacity management.[264] For instance, SEAFDEC organised the expert meeting on fishing vessel registration[265] in order to facilitate the process of improving and/or establishing systems for registration of vessels in the ASEAN region. The objectives of this meeting was to review the existing registration systems in the region of both large-scale and small-scale fisheries, to discuss problems and benefits linked to these systems and to follow up on the requirements for fishing vessel registration within respective State.[266] This activity addressed the fundamental issue in managing fishing capacity in the region.

November 2009) 2. At these meetings, the issues related to fishing capacity were mainly discussed including the cooperation on vessel registration, port monitoring and monitoring of landings by vessels from neighbouring States in the area, development of MCS network, and IUU fishing. See, SEAFDEC, 'Report of the Sub-Regional Meeting on the Gulf of Thailand' (SEC/SP/99, 24-26 February 2009) 2-5.

[262] SEAFDEC, 'Provisional Prospectus of the First Meeting of the Andaman Sea Sub-region 20-22 October 2009, Phuket, Thailand' (INF01, 20-22 October 2009 2009) 3.

[263] This meeting was organised on 20-22 October in Phuket, Thailand. The relevant States in the Andaman Sea sub-region attending the meeting were India, Indonesia, Malaysia, Myanmar, and Thailand. See, SEAFDEC, *The First Meeting of the Andaman Sea Sub-region organized in Phuket* <http://www.seafdec.org/cms/index.php?view=article&catid=38%3Anews&id=146%3Athe-first-meeting-of-the-andaman-sea-sub-region-organized-in-phuket&option=com_content&Itemid=63>.

[264] The SEAFDEC Governing Council has supported the establishment in April 2008 of the Regional Scientific Advisory Committee (RSAC) for Fisheries Management in Southeast Asia for the need to improve fisheries management, including to address issues relevant to fishing capacity and IUU fishing, as well as to enhance information collection for fisheries management. To facilitate such initiative, SEAFDEC has also supported the establishment of ASEAN Regional Fisheries Management Mechanism (ARFMM), which was agreed to develop by ASEAN in May 2008. See, FAO, above n 246, 18.

[265] It was held on 30 June-2 July 2008 in Phuket, Thailand.

[266] SEAFDEC, 'Report of the Expert Meeting on Fishing Vessel Registration, Phuket, Thailand, 30 June-2 July 2008' (SEC/SP/95, October 2008 2008) 1.

3.3.3 Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region

The Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region[267] was adopted by the Ministers of States in the region as a commitment to improve fisheries management and address IUU fishing.[268] The *RPOA* covers the areas of the South China Sea, Sulu-Sulawesi Seas (Celebes Sea) and the Arafura-Timor Sea. The ministerial meeting that signed the *RPOA* was held on 2-4 May 2007 in Indonesia. Representatives of 11 States, i.e., Republic of Indonesia, Australia, Brunei Darussalam, Cambodia, Malaysia, Papua New Guinea, the Philippines, Singapore, Thailand, Timor-Leste and Vietnam, attended the meeting, and these States continue to cooperate to implement the objectives of the *RPOA*. For the purpose of following-up the activities, the Ministers also agreed to form a Coordination Committee who has a role to monitor and review the effective implementation of the measures suggested in the *RPOA*, as well as to provide strategic advice and direction to member States on coordination and implementation of *RPOA* measures.[269]

The *RPOA* is a voluntary instrument, and has the basic principles in accordance with the international instruments that have been established, including the *LOSC* (especially articles 61-64, 116-119 and 123), the *Fish Stocks Agreement*, the *Compliance Agreement*, the *CCRF*, and the FAO IPOAs (e.g., *IPOA-Capacity*). The main objectives of the *RPOA* are 'to enhance and strengthen the overall level of fisheries management in the region' and 'to optimise the benefit of adopting responsible fishing practices.'[270] The actions provided under the *RPOA* concern the conservation of fisheries and their environment; fishing capacity management; and combating IUU fishing.

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[267] The Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region, hereinafter referred to as *RPOA*.

[268] The Republic of Indonesia, along with Australia, has initiated this *RPOA*. It is the first regional plan of its kind in the world and is a response to the call for States to take cooperative measures to implement the International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU). See, FAO, above n 246, 2.

[269] RPOA Secretariat, 'Report to Ministers on the Implementation of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices Including Combating IUU Fishing in the Region' (May 2008) <http://www.rpoa.sec.kkp.go.id/images/pdf/minister/may_2008.pdf>.

[270] RPOA Secretariat, 'Report to Ministers on the Implementation of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices Including Combating IUU Fishing in the Region' (5 November 2009) <http://www.rpoa.sec.kkp.go.id/images/pdf/minister/november_2009.pdf>.

In terms of managing fishing capacity, the *RPOA* provides guidelines used to control States' fishing capacity on a basis of cooperation within the region. The *RPOA* requires States to manage fishing capacity of their fleet by conducting a series of actions:[271] (i) assessing the state of their fisheries resources and the capacity of fishing fleet; (ii) introducing management measures to deter fishing capacity from being above the level that reduces sustainable fish stock; (iii) reducing overcapacity without transferring the capacity to other fisheries that have already exploited at maximum sustainable rate; (iv) cooperating to assess, conserve and manage straddling fish stocks occurring both within EEZs and adjacent areas to the EEZs; (v) developing and implementing national plans of action that aims to reduce overcapacity; (vi) collecting and sharing information on fishing capacity management; and (vii) respecting traditional, artisanal and small-scale fisheries, as well as providing them assistance in fisheries resource management.[272] These actions of the *RPOA* affirm the guidelines introduced by the IPAO-Capacity, and extend the concerns on artisanal and small-scale fisheries as they are ones of the main fisheries sector in this region. Additionally, with regard to coastal and flag States responsibilities, the *RPOA* suggests States to maintain their comprehensive and updated vessel registers, catch and fishing effort data, as well as develop an appropriate regional approach to exchange such information among States.[273] The *RPOA* further required States to collaboratively work with regional organisations, such as FAO/APFIC, SEAFDEC, IOTC, WCPFC, in order to develop and implement conservation and management measures for optimum utilisation of fish stocks.[274] Specially, States are encouraged to ratify the *LOSC* and the *Fish Stocks Agreement*.[275]

Since its adoption, the *RPOA* has played a significant role on fishing capacity management in the region. At the FAO/APFIC Workshop on 'Managing Fishing Capacity and Combating IUU Fishing in Asia' organised in Phuket, Thailand on 13-15 June 2007, the *RPOA* was used as a main reference to prioritise the regional actions required in managing fishing capacity and combating IUU fishing in Asia. According to the results of the workshop, the five key steps that States should take in order to manage

[271] *RPOA*, Action Plan, para 6.

[272] Ibid.

[273] *RPOA*, Action Plan, para 5.

[274] *RPOA*, Action Plan, para 3-4.

[275] *RPOA*, Action Plan, para 2.1.

fishing capacity include: (i) carrying out the assessment of existing fishing capacity according to enhanced vessel registers of fishing vessels and/or updated census of fishing vessels and fishing effort; (ii) initiating a program for capacity management by starting with major fisheries, such as trawl fisheries, and setting a reference point of capacity reduction for the fisheries facing overcapacity problem; (iii) developing the NPOA for capacity management through consultations of stakeholders with the support of relevant agencies; (iv) introducing management measures with the concern of socio-economic conditions. The measures should include rights-based measures where it is feasible, and ensure that excess capacity will be eliminated, not transferred; and (v) gaining support from regional or international organisations, and establishing cooperation in the region to harmonize initiatives.[276] These steps concluded from this workshop are expected to be undertaken by States in the region.

In addition, at the first meeting on implementation of the *RPOA* organised by *RPOA* Secretariat[277] in Kuala Lumpur, Malaysia in August 2007, priority strategic areas that should be further strengthened were identified, i.e., (i) MCS systems; (ii) coastal States responsibilities; (iii) capacity building in the region; (iv) current status of resources and management in the region; and (v) Port State Measures. It was also agreed to separate the areas covered by the *RPOA* into three sub-regions due to their different maritime geography.[278] The three sub-regions include the Southern and Eastern Areas of the South China Sea and the Sulu-Sulawesi Seas, the Arafura and Timor Seas, and the Gulf of Thailand.[279] The work programs to implement actions against these five priorities are therefore arranged based on these sub-regions.[280]

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[276] FAO APFIC, above n 147, 2.

[277] The Secretariat arrangements were hosted by Indonesia for the first two years and then extended for another two years. See, RPOA Secretariat, above n 269; RPOA Secretariat, above n 270.

[278] RPOA Secretariat, above n 269.

[279] The subregional MCS Networks have been established based on these three sub-regions. The MCS Network for the Southern and Eastern Area of the South China Sea and the Sulu-Sulawesi Seas is participated by Malaysia, Indonesia, the Philippines and Brunei Darussalam. The Arafura and Timor Seas MCS Network is participated by Australia, Indonesia, Timor Leste and Papua New Guinea, whereas the Gulf of Thailand MCS Network is participated by Thailand, Cambodia, Malaysia and Vietnam. See, RPOA Secretariat, 'Report to the Committee on Fisheries (COFI) of the UN Food and Agriculture Organisation on the Implementation of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices Including Combating Illegal, Unreported and Unregulated (IUU) Fishing in the South East Asia Region' (January 2011) <http://www.rpoa.sec.kkp.go.id/images/pdf/cofi/cofi_jan2011.pdf>.

[280] There have been a series of workshops at regional and sub-regional levels that concern such five priorities. For example, the regional workshops included port monitoring techniques workshop in Penang, Malaysia on 15-17 June 2009, capacity building and MCS curriculum development workshop in Manado,

At the meetings of the *RPOA* Coordination Committee in 2009 and 2010,[281] work plans focusing on emerging priorities were adopted. They included to improve data and information sharing on licensed fishing vessels, carrier vessels and port monitoring among member countries, to enhance capacity building on MCS implementation to promote responsible fisheries and to combat IUU fishing practices, as well as to accelerate harmonisation of fisheries legal framework.[282] In terms of harmonising fisheries legislation, an *RPOA* study produced a Framework for Model Fisheries Legislation in South East Asia,[283] which provides not only an in-depth analysis of the gaps, weaknesses and strengths of fisheries legislation of each member State[284] but also a framework for model fisheries legislation to promote regional harmonisation of fisheries management legislation through compatible and comprehensive fisheries management legislation in *RPOA* member States.[285] Member States have found this model legislation useful as a basis to frame or amend their legislation for the framework of responsible fishing management practices.[286] Member States are then required to

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Indonesia on 12-14 August 2009. The sub-regional workshops included three sub-regional MCS workshops, i.e., the Southern and Eastern area of the South China Sea and the Sulu-Sulawesi Seas workshop in Malaysia on 26-28 August 2008, the Arafura and Timor Seas workshop in Darwin, Australia on 28-29 April 2009, and the Gulf of Thailand workshops in Bangkok on 28-29 March 2008 and 24-26 February 2009.

[281] The second meeting of the RPOA Coordination Committee was held in Lombok, Indonesia on 4-5 November 2009, whereas the third meeting was held in Da Nang, Vietnam on 1-2 December 2010. See, RPOA Secretariat, above n 270; RPOA Secretariat, 'Report to Ministers on the Implementation of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices Including Combating IUU Fishing in the South East Asia Region' (December 2010) <http://www.rpoa.sec.kkp.go.id/images/pdf/minister/december_2010.pdf>.

[282] RPOA Secretariat, above n 270.

[283] William Edeson et al, 'Framework Study for Model Fisheries Legislation in South East Asia: Report on Australia Legislation' (Australian National Centre for Ocean Resources and Security (ANCORS), November 2010) <http://www.apip-apec.com/au/plan/files/37d230b932323ba22c2d2d5afc17378f.pdf>.

[284] The legislation of each of the 11 member States has been assesses against a set of benchmarks to identify the current strengths and weaknesses of each in terms of its ability to implement responsible fishing management practices. These benchmarks include ecosystem approach to fisheries management, data collection, monitoring and research, management plans, fishing vessel legislation, flag State authorisations to fish and effective control over nationals, authorisations to fish by the coastal State, MCS, port State controls, catch certification and other trade measures, tracking proceeds of illegal fishing and reporting requirements. Based on assessments, there are a number of gabs and weaknesses identified in the study. They are, for example, weak vessel registration systems, absence of measures to exercise effective port state controls over fishing vessels, lack of requirements in some States' laws to enforce their vessels to comply with international agreements or the laws of other States, absence of articulate principles of data collection, compilation, collection and exchange in most of fisheries laws of member States. See, ibid.

[285] RPOA Secretariat, above n 281.

[286] RPOA Secretariat, 'Report to the Committee on Fisheries (COFI) of the UN Food and Agriculture Organisation on the Implementation of the Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices Including Combating Illegal, Unreported and Unregulated (IUU) Fishing in the South

continue providing the updates on their work to strengthen their fisheries legislation based on the findings of this study, as appropriate.[287]

Furthermore, a Capacity Development Framework for Marine Capture Fisheries Management in South East Asia has been prepared to provide structured guidelines on building human capacity for the management of marine capture fisheries.[288] There are eight components, including fishing capacity management, under this framework.[289] Under fishing capacity management that has been identified as a national priority, capacity building to strengthen vessels registration and licensing schemes was considered the highest priority across the *RPOA* member States in order to support better management of fishing capacity. It is due to the fact that effective vessel licensing and registration is an essential component to manage and monitor fishing capacity. Additionally, right-based fisheries management (RBFM) has been accepted by the participating States to be a possible management tool to control fishing capacity, as RBFM might be effectively applied in tropical multi-species and multi-gear fisheries, and those with a large number of participants.[290] The planning and implementation of alternative livelihoods programs to support capacity reduction are also required by *RPOA* participating States.[291] In terms of implementation of this study's findings, however, member States concluded to continue the implementation of their particular

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East Asia Region' (January 2012) <http://www.rpoa.sec.kkp.go.id/images/pdf/cofi/cofi_juli%202012.pdf>.

[287] Ibid.

[288] This Framework was commissioned by the Australian Government Department of Agriculture, Fisheries and Forestry, with funding from the Public Sector Linkages Program of the Australian Agency for International Development (AusAID). A participatory, bottom-up approach was taken to identify capacity development needs for fisheries management agencies at the national level. Regional priorities were then formulated through a workshop held in Da Nang, Vietnam in November 2010, of participating country representatives. See, Department of Agriculture Fisheries and Forestry, *Net Returns - A Human Capacity Development Framework for Marine Capture Fisheries Management in South East Asia* (Department of Agriculture, Fisheries and Forestry, 2011) 3.

[289] Other seven components include fisheries management planning, strengthening the scientific and economic basis for fisheries management, strengthening MCS, strengthening legal, policy and administrative support, strengthening information systems, effective decentralisation, and strengthening legal, policy and administrative support. The first four components, including fishing capacity management, are considered as regional priorities, whereas the last three components are dependent on the individual circumstances of the participating State. See, ibid 4-5.

[290] Ibid 17.

[291] Ibid 18.

priorities rather than to have a follow-up workshop that brings together key partners to develop a plan of action to progress the agreed priorities of this Framework.[292]

Regional organisations playing as advisory bodies of the *RPOA* consist of FAO/APFIC, SEAFDEC, InfoFish and Worldfish Center.[293] The guidelines provided under the *RPOA* have been recommended by these advisory bodies to be used to manage fishing capacity.[294]

However, although this *RPOA* has been recognised as a useful framework for managing fishing capacity, there are still some tasks that require organisations and arrangements to undertake. Such tasks include identifying positive and negative impacts of reducing fishing overcapacity, in particular strategies for mitigating negative human impacts, developing effective and practical methods for assessing fishing capacity and strategies for encouraging capacity reduction, and developing regional cooperation to manage fishing capacity.[295] Currently, the most significant challenge for States in the Southeast Asian region is the implementation of their NPOA for fishing capacity management. It is imperative that States should assess their current status in capacity reduction and prepare an action plan to address such issues, as well as determine whether the instruments can achieve their goals.

[292] RPOA Secretariat, above n 286.

[293] RPOA Secretariat, above n 269.

[294] At the thirtieth session of the APFIC meeting held in Manado, Indonesia on 11-13 August 2008, the meeting concluded that the *RPOA* is a useful framework for States and regional organisations to apply coordinated approaches in order to manage fishing capacity and IUU fishing. See, FAO, above n 246, 12; At the ASEAN-SEAFDEC Regional Expert Consultation on Future Roles of SEAFDEC in Fisheries Management in Southeast Asia held in Bangkok on 26-28 June 2007, it was concluded and recommended that the principles of the RPOA should be considered by the Regional Scientific Advisory Committee for Fisheries Management in Southeast Asia (RSAC), which would be established by SEAFDEC. See, Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, *RPOA: An Initiative and a Regional Commitment of the Countries Bordering the South China Sea, Sulu-Sulawesi Seas and Arafura-Timor Seas to Manage Fisheries Resources* <www.apfic.org/modules/xfsection/download.php?fileid=249 >.

[295] FAO RAP, 'APFIC Second Regional Consultative Forum Meeting: Adapting to Emerging Challenges-Promotion of Arrangements for the Management of Fisheries and Aquaculture in Asia-Pacific' (RAP PUBLICATION 2008/12, 6-9 August 2008) xi.

3.4 Criteria for Fishing Capacity Management based on International and Regional Legal and Policy Framework

Based on discussions above, a set of criteria for the management of fishing capacity in accordance with international and regional legal and policy frameworks is developed and summarised in Table 3.1. Based on the criteria presented, a series of actions for States to take in order to manage their fishing capacity can be summarised as follows:

1. States should determine their current fishing capacity by implementing systematic measurement plan in their national policy framework;
2. States should assess the level of their fishing capacity whether there is excess capacity and/or overcapacity problem, as well as examine the factors contributing to it;
3. Where excess capacity and/or overcapacity exist, States should immediately address the problem by implementing proper management tools;
4. Where overcapacity issues have not yet arisen, precautionary management tools should be implemented in order to prevent their occurrence. States should develop national plans of action for fishing capacity management; and
5. State should participate in relevant international agreements and cooperate with other States through RFMOs or arrangements to address overcapacity problems.

These criteria should be applied on marine capture fisheries of States at the national, regional and international levels. In Chapter 3.1, these criteria will be used to test whether Thailand has adequate management for fishing capacity.

Table 3.1: Criteria for the management of fishing capacity based on relevant international and regional instruments

Criteria	Scope	Measures	Instruments
(1) Measurement and assessment of fishing capacity (including vessel registration and licensing)	Within national jurisdiction	-determine capacity to harvest living resources in EEZ at the level of optimal utilisation or TAC of such resources	-*LOSC*(art 62(1,2))
		-specify required information of fishing vessels, such as catch and effort statistics and fishing position reports	-*LOSC*(art 62(4)(e))
		-license fishers, fishing vessels and equipments	-*LOSC*(art 62(4)(a))
		-require authorization for all vessels	-*CCRF*(art 7.6.2)
		-establish records of fishing vessels	-*IPOA-Capacity*(para 16)
		-implement an improved system of local and national registration of fishing vessels	-Regional *CCRF*
	High seas	-provide information necessary for assessing the capacity (e.g., records of fishing vessels) and international cooperation	-*FAO Compliance Agreement*(art IV,V,VI)
		-implement the appropriate procedures of authorization for fishing vessels and ensure the authorized fishing vessels will fish with conditions of the authorization	-*FAO Compliance Agreement*(art III(2))
		-authorize fishing fleets only where States can exercise effectively responsibilities on them	-*Fish Stock Agreement*(art 18(2))
		-establish records of fishing vessels	-*IPOA-Capacity*(para 18)
	Regional level	-require CPCs that have more than 50 vessels on the 2003 IOTC record of vessels, to limit, in 2004 and following years, the number of their fishing vessels larger than 24 metres overall length to the number of fishing vessels registered in 2003	-IOTC Resolution 03/01
		-require CPCs to notify the lists of vessels (over 24 metres overall length and under 24 metres if they operate outside their EEZs) by gear type that fish for tropical tunas in 2006 and fish for swordfish and albacore in 2007, applicable during 2012 and 2013, will be reviewed in 2014	-IOTC Resolution 12/11
		-assess the state of fisheries resources and fishing fleet capacity	-*RPOA*(para 6)
		-maintain comprehensive and updated vessel registers, catch and fishing effort information, as well as develop an appropriate regional approach to exchange such information among States	-*RPOA*(para 5)
	All levels	-support in measurement of fishing capacity	-*IPOA-Capacity*(paras 11-2)
		-conduct national, regional and global assessments of capacity	-*IPOA-Capacity*(para 7)
		-support in assessment of fishing capacity	-*IPOA-Capacity*(paras 13-5)
		-improve capability for monitoring fishing capacity	-*IPOA-Capacity*(para 8)
(2) Prepare and implement the management measures	Within national jurisdiction	-implement the management measures ensuring that the living resources in the EEZ are not endangered by overexploitation	-*LOSC*(art 61(2))
		-regulate seasons and areas of fishing, types, sizes and amount of gear, as well as types, sizes and number of fishing vessels that are allowed	-*LOSC*(art 62(4)(c))

Table 3.1: Cont.

Criteria	Scope	Measures	Instruments
(2) Prepare and implement the management measures	High seas	-take measures through RFMOs to maintain harvested species at levels that can produce MSY (to determine commensurate fishing effort for such MSY) -take measures to deter or eliminate overfishing and excess capacity and ensure levels of fishing effort do not exceed those commensurate with the sustainable use of fisheries resources -immediate actions for important transboundary, straddling, highly migratory and high seas fisheries that require urgent measures -manage fishing capacity of vessels and cooperate with other States in reducing overcapacity	-*LOSC*(art 119(1)(a)) -*Fish Stock Agreement*(art 5(h)) -*IPOA-Capacity*(para 8) -*IPOA-Capacity*(para 31)
	Regional level	-strengthen RFOs and related mechanisms to improve fishing capacity management -become members of RFOs or arrangements or agree to adopt the conservation and management measures established by such RFOs or arrangements to fishing vessels -prevent the build-up of excess capacity -prepare NPOA taking into account of the regional specific issues, types of fisheries, and appropriate issues recommended by the *IPOA-Capacity* -establish management measures to prevent fishing capacity from the exceeding level that obstruct the capability of fish stocks to sustainably reproduce -cooperate to assess, conserve and manage fisheries resources where they straddle national boundaries or occur both within EEZs and in areas beyond and adjacent to the EEZs -work on the collection, management and sharing of information on the management of fishing capacity -provide assistance to traditional, artisanal and small-scale fisheries in terms of fisheries resource management	-*IPOA-Capacity*(para 8) -*IPOA-Capacity*(para 34) -Regional *CCRF* -Regional *CCRF* -*RPOA*(para 6) -*RPOA*(para 6) -*RPOA*(para 6) -*RPOA*(para 6)
	All levels	-eliminate fisheries subsidies contributing to overcapacity by adopting new WTO rules on fisheries subsidies -prevent overfishing and excess fishing capacity; implement management measures ensuring fishing effort commensurate with fishery resource and their sustainable use. -implement measures that avoid economic waste and provide both sustainability and economic viability -establish measures through appropriate policy, legal and institutional framework based on best scientific evidence available	-WTO rules on fisheries subsidies -*CCRF*(art 6.3,7.1.8) -*CCRF*(art 7.2.2) -*CCRF*(art 7.1.1)

Table 3.1: Cont.

Criteria	Scope	Measures	Instruments
(2) Prepare and implement the management measures	All levels	-implement an efficient, equitable and transparent management measures for fishing capacity by 2003, not later than 2005	-*IPOA-Capacity*(para 7)
		-prepare, implement and monitor national plans by taking account the consequences of different resource management systems on fishing capacity, make public NPOA by 2002, review at least every 4 years	-*IPOA-Capacity*(paras 8,19,24)
		-implement strategies through complementary mechanisms to promote IPOA implementation, awareness building and education, technical cooperation at the international level, and coordination	-*IPOA-Capacity*(para 8)
		-assess possible impact of all factors, e.g., subsidies, economic incentives, that contribute, directly or indirectly, to the accumulation of excess fishing capacity, concerning the needs of artisanal fisheries	-*IPOA-Capacity*(paras 25-6)
		-consider participating in relevant international agreements, e.g., the Compliance Agreement, the Fish Stocks Agreement	-*IPOA-Capacity*(para 29)
(2.1) Overcapacity/excess capacity exist	Regional level	-establish mechanism to eliminate overcapacity ensuring the sustainable use of fisheries resources	-Regional *CCRF*
		-freeze the number of fishing vessels at current levels	-Regional *CCRF*
		-reduce the number of fishing vessels at the suitable rate respecting socio-economic impacts	-Regional *CCRF*
		-monitor the impact of vessel reduction and prevent new entry into overexploited fishery	-Regional *CCRF*
		-provide training on alternative occupational skills and encourage fishers to leave overexploited fisheries	-Regional *CCRF*
		-develop appropriate indicators to assist fishing capacity management	-Regional *CCRF*
		-implement management measures, such as limit access regime of fisheries, promote co-management and right-based fisheries, limit catch and fishing effort, ban particular fishing gears	-Regional *CCRF*
		-reduce overcapacity without transferring such capacity to other fully exploited fisheries, taking account potential socioeconomic impacts	-*RPOA*(para 6)
		-develop and implement NPOA that aims to decrease overcapacity and get rid of illegal fishing activities where these problems have been arisen	-*RPOA*(para 6)

Table 3.1: Cont.

Criteria	Scope	Measures	Instruments
(2.1) Overcapacity/excess capacity exist	All levels	-States and RFMOs are required to limit fishing capacity at current level and then gradually decrease fishing capacity -decrease fishing capacity, if required, in order to balance the level of fishing capacity with available fisheries resources on a sustainable basis	**1.1.1** -*IPOA-Capacity*(para 7) -IPOA-Capacity(para 21)
(2.2) Overcapacity/excess capacity are not yet arisen	High seas	-apply precautionary approach for conservation, management and exploitation of straddling fish stocks and highly migratory fish stocks by setting precautionary reference points (take into consideration excess capacity) and implement measures to ensure that such point will not be exceeded, suggest to use MSY as reference point	-*Fish Stock Agreement*(art 6(1),annex II(1),art 6(4))
	Regional level	-apply precautionary approach in accordance with the guidelines stated in the *Fish Stocks Agreement* -apply the provided interim target and limit reference points for albacore, bigeye tuna, skipjack tuna, yellowfin tuna and swordfish -apply a precautionary approach in case of uncertainty regarding the state of fishery resources	-IOTC Resolution 12/01 -IOTC Resolution 13/10 -Regional *CCRF*

3.5 Conclusion

This chapter provided the criteria for the management of fishing capacity in areas within national jurisdiction, the high seas and in the regions where Thailand is located in particular. These criteria, which aim to prevent and eliminate overcapacity problem in marine capture fisheries, were developed in accordance with provisions adopted by both legally and non-legally binding relevant international and regional instruments. The international instruments examined were the *LOSC*, the *Compliance Agreement*, the *Fish Stocks Agreement*, the WTO Agreement on Subsidies and Countervailing Measures, the *CCRF* and the *IPOA-Capacity*. For regional instruments, the IOTC Resolutions, SEAFDEC Regional *CCRF*, and the *RPOA*, were discussed. Based on the analysis of the abovementioned instruments, a set of criteria for fishing capacity management can be summarised as a series of actions, including, (i) measuring current fishing capacity; (ii) assessing the level of fishing capacity whether they are in the status of excess capacity and/or overcapacity; (iii) when the problem of excess capacity and/or overcapacity exists, addressing this problem immediately and implement proper management tools; (iv) where excess capacity and/or overcapacity issues have not yet arisen, implementing precautionary management tools to prevent these issues, as well as developing the NPOA for fishing capacity management and implementing it at all levels; and (v) participating in relevant international agreements and cooperating with RFOs or arrangements to address overcapacity problem. States should apply these criteria at all fisheries levels.

CHAPTER 4 FISHING CAPACITY MEASUREMENT, INCENTIVE BLOCKING MEASURES FOR MANAGING FISHING CAPACITY AND IMPLEMENTATION BY THAILAND

4.1 Introduction

After a discussion of the legal and policy requirements to manage fishing capacity, it is paramount to examine the technical measures that will enable the implementation of relevant State obligations under global and regional agreements. This chapter first describes the details on measuring and assessing overcapacity in fisheries by quantitative and qualitative methods. It additionally provides the standards and measures widely used to manage fishing capacity, focusing on incentive blocking measures. These measures are categorised into two groups, i.e., input regulations and output regulations. Input regulations include limited licensing programs, individual effort quota programs, as well as gear and vessel restriction programs, whereas vessel catch limits measure is discussed as output regulations. This chapter further examines the application of such measures by Thailand concerning legislation and institutional aspects.

4.2 Measuring and Assessing Overcapacity in Fisheries

According to the criteria analysed and presented in Chapter 3, the initial steps in managing fishing capacity is that States should examine the current level of their fishing capacity and assess it whether there actually is the problem of excess capacity and/or overcapacity. Thus, systematic assessment of capacity, of overcapacity in particular, is essentially established at all fisheries levels.[1] The level of fishing capacity can be determined by both quantitative measures and qualitative indicators. Details of both methods are analysed in the following sections.

[1] They include national, regional and global levels. See, Rebecca Metzner, *Fisheries and Aquaculture Topics. Different Perspectives on Fishing Capacity. Topics Fact Sheets.* (27 May 2005) FAO <http://www.fao.org/fishery/topic/14856/en>.

4.2.1 Quantitative Measures for Overcapacity

The definition of the target level of capacity is required for quantitative measures, so that overcapacity can be defined as the difference or ratio of the potential level to the target level.[2] Further, fishing capacity can be determined either on input or on output base and in response to a wide range of indicators. The Technical Consultation on the Measurement and Assessment of Fishing Capacity organised by the FAO[3] has suggested that any State should estimate its fishing capacity on both input and output bases for the purpose of broad international comparison.[4] Examples of the measures of capacity on input and output bases are presented below.

4.2.1.1 Input-based Capacity

Measures of capacity on input basis can be applied with a tacit assumption that output level is relevant to physical inputs used in the fishery. If such inputs are entirely used, the fleet capacity will therefore be a function of these inputs.[5] In this case, the utilisation level will connect with the activity level, such as days of fishing operation. Thus, the fleet capacity is connected with the fixed inputs that are used in the fishery.[6] The fixed inputs typically involve the number or characteristics of the vessels, or the capital stock. Measures of capacity base should concern different characteristics across vessels or fleet segments in order to achieve effective management. The different level of productivity of a variety of inputs must be concerned and measured for proper capacity analysis.[7] In this sense, it can be carried out by identifying the characteristic of a particular vessel, which determines the total fishing power of such vessel. Then, the

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[2] Rebecca Metzner, *Fisheries and Aquaculture Topics. Assessing Fishing Capacity and Overcapacity. Topics Fact Sheets.* (27 May 2005) FAO <http://www.fao.org/fishery/topic/14858/en>.

[3] This consultation meeting was held in Mexico on 29 November-3 December 1999. See, FAO, 'Technical Consultation on the Measurement of Fishing Capacity. Mexico City, Mexico, 29 November - 3 December 1999' (FAO Fisheries Report No. 615, FAO, 2000).

[4] Steve Cunningham and Dominique Greboval, *Managing Fishing Capacity: A Review of Policy and Technical Issues* (FAO, 2001) 1.

[5] John M Ward et al, *Measuring and Assessing Capacity in Fisheries: 1. Basic Concepts and Management Options* (FAO, 2004) 16; Sean Pascoe, Louisa Coglan and Simon Mardle, 'Physical Versus Harvest-based Measures of Capacity: the Case of the United Kingdom Vessel Capacity Unit System' (2001) 58(6) *ICES Journal of Marine Science / Journal du Conseil* 1243, 1243.

[6] Ibid.

[7] Sean Pascoe et al, *Measuring and Assessing Capacity in Fisheries: 2. Issues and Methods* (FAO, 2003) 36.

utilisation of capacity may be separately estimated for fishing units with the same characteristics in terms of fishing activity, such as gear type applied, fishing ground, and target species.[8]

The key indicator of fixed input capacity is a measure of the capital stock, which can basically be the number of vessels. However, there was an argument that using the number of vessels as such indicator is inadequate for fisheries.[9] Therefore, other measures that take into account not only the number of fishing vessels but also the size, total gross tonnage, total engine power of these vessels, have been developed. These measures recognise that harvesting potential of a small fleet of large vessels could be similar in effect to (if not bigger than) a large fleet of small vessels.[10]

At the FAO Technical Consultation Meeting in Mexico (1999), a list of main capacity characteristics by gear type was developed.[11] Such list, which captures the difference of possible characteristics of gear types, is presented in Table 4.1. Apart from the fixed inputs, there are also variable inputs applied to capacity. Variable inputs could be used to determine the potential output that can be generated from the current capacity base.[12] If taking variable inputs into consideration as well, the key indicator of this capacity measure is effort.

Fishing effort is a theoretical concept and consisted of a number of components, i.e., fishing period, level of inputs, level of technology and the expertise of a vessel master and crews. Basically, effort is explained as a combined measure of fixed (i.e., vessel) and variable (e.g., crews, fishing days, fuel) components.[13] Effort, therefore, can

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[8] Ibid.

[9] James E Kirkley and Dale E Squires, 'A Limited Information Approach for Determining Capital Stock and Investment in a Fishery' (1986) 86(2) *Fish. Bull.* 339, quoted in Pascoe et al, above n 7, 37.

[10] Pascoe et al, above n 7, 37.

[11] FAO, above n 3, 41.

[12] Pascoe et al, above n 7, 36; James E Kirkley and Dale Squires, 'Capacity and Capacity Utilisation in Fisheries Industries' in Sean Pascoe and Dominique Greboval (eds), *Measuring Capacity in Fisheries*, FAO Fisheries Technical Paper (FAO, 2003) vol 445, 314, 39.

[13] The concept of fishing effort originates from the biological literature on fisheries; the notion that a single variable, such as fishing effort, represents the influences of all inputs on output is related to the economic concepts of separability and aggregation. The notion of fishing effort may also be viewed as though it is an intermediate output of a two-stage production process. See, Robert A Pollak and Terence J Wales, 'Specification and Estimation of Nonseparable Two-stage Technologies: the Leontief CES and the Cobb-Douglas CES' (1987) 98(2) (April) *J. Political Econ.* 311, quoted in Pascoe et al, above n 7, 39.

possibly be expressed as a total input, called fishing effort. Effort is commonly measured in terms of time used for fishing or days at sea (e.g., fishing days or fishing hours per vessel).[14]

Table 4.1: Main characteristics of capacity by gear type

Gear type	Characteristics of capacity
All gears	Number of vessels, licences, participants, or gear units (whichever is relevant); trip duration; actual number of trips per year or season; potential number of trips per year or season; total catch including discards; level of mechanization
Beach nets	As for all gears, plus total length of nets
Handline	As for all gears, plus number of lines used
Set nets	As for all gears, plus total length of nets, average set time
Traps	As for all gears, plus number of traps, average soak time
Diving	As for all gears
Purse seine	As for all gears, plus time searching for fish; use of fish aggregating or fish-finding aid, e.g., fish aggregating devices (FADs), airplanes and sonar; average sets per trip; vessel gross tonnage or other volumetric measures; engine power (kW); fish hold capacity
Longline	As for all gears, plus average hooks per set, average sets per trip; average soak time; use of fish-finding aid; vessel gross tonnage or other volumetric measures; fish hold capacity
Gill nets	As for all gears, plus type of nets, total length and depth of nets, mesh size; average set time; average sets per trip; use of fish-finding aid; vessel gross tonnage or other volumetric measures; engine power (kW); fish hold capacity
Trawl/Dredge	As for all gears, plus gear dimensions (e.g., head-rope length, beam length);[15] mesh size; tow time; average tows per trip, use of fish-findings aid; vessel gross tonnage or other volumetric measures; engine power (kW); fish hold capacity

Source of table: FAO, 'Technical Consultation on the Measurement of Fishing Capacity' (FAO Fisheries Report No. 615, FAO, 29 November-3 December 1999) 41.

In most fisheries, some long-term potential yield (LTPY), such as MSY and MEY, can be determined based on an assessment of the fish stock. Associated with a target yield is

[14] Pascoe et al, above n 7, 39

[15] Ibid 37.

a target effort level, which is used to determine the most appropriate fleet size.[16] A level of effort may be generated by a larger number of underutilised vessels or a smaller number of fully utilised vessels, which is preferable from an economic perspective.[17] However, using input-based measures for measuring overcapacity is very complicated. It is because these measures involve not only the vessel used to harvest fish, but also other factors, such as labour, capital and fish stocks. Furthermore, seasonality and fluctuation of stocks, the condition of multi-species and multi-gear fisheries can increase the complexity when determining the optimal mix of inputs needed in producing a desired output level.[18]

4.2.1.2 Output-based Capacity

Capacity measures on output basis directly determine the potential output and/or the level of capacity utilisation. This measurement is usually conducted for the individual vessel.[19] The relationship between fixed input level, utilisation level or such inputs and output level is not directly expressed in the estimation of the output-based capacity measure.[20] Such estimation, however, does not mainly adopt the similar assumptions, which are tacit in the input-based measures. Consequently, the output-based measures are not impacted by the distribution of inputs.[21]

The capacity output refers to the maximum catch level that can be generated in a time unit (e.g., fishing season or fishing year) by existing vessels and equipments under given working conditions, that factors of production can possibly be changeable.[22] In the case of fisheries, the variable factors of production are, for instance, fishing days (or hours), labours, quantities of gear. These variable factors are independently determined, not identified together with the capital or capacity base determined in terms of the

[16] Ward et al, above n 5, 17.

[17] Ibid.

[18] Ibid 17-8.

[19] Ibid 16; Sean Pascoe et al, 'Measuring and Appraising Capacity in Fisheries: Framework, Analytical Tools and Data Aggregation' (FAO Fisheries Circular No. 994, FAO, 2004) <http://www.fao.org/docrep/008/y5443e/y5443e00.htm> 6-7.

[20] Ward et al, above n 5, 17-8.

[21] Ibid.

[22] Pascoe et al, above n 7, 42; Niels Vestergaard, Dale Squires and James E Kirkley, 'Measures of Capacity in a Multispecies Danish Fishery' in Sean Pascoe and Dominique Greboval (eds), *Measuring Capacity in Fisheries*, FAO Fisheries Technical Paper (FAO, 2003) vol 445, 314, 170.

characteristics of vessel.[23] Capacity output is, therefore, basically defined by the capacity base and is correspondingly connected with the full utilisation level of variable inputs, this relationship, however, is not necessarily proportional.[24]

The methods used to estimate capacity, both output-based and input-based measures, and capacity utilisation depend greatly on the level of available data.[25] For output-based measures, there are various methods, including (i) **rapid appraisal (RA) techniques**, which has been largely used in developing States where formal data collection is not practical or information needed is not available. These techniques focus on the collection of local knowledge gained from informal interviews with key participants, such as fishers, fisher representatives, in the fishery;[26] (ii) **surveys and expert opinion**, which is useful to estimate fishing capacity and potential overcapacity when fisheries data is limited. Many surveys may be needed to separately conduct with participants, i.e., fishers;[27] (iii) **peak-to-peak analysis**, which is conducted based on an assumption of a direct relationship between the input level (with an index of CPUE) and the output level. In this sense, lower CPUEs are assumed to indicate the capacity underutilisation;[28] (iv) **stochastic production frontiers (SPF)**, which are used based on the assumption that 'output is a function of the level of inputs and the efficiency of the producer in using those inputs. Lower levels of output derived from this method would suggest a combination of inefficient input use and capacity underutilisation';[29] and (v) **data envelopment analysis (DEA)**, which is 'a mathematical programming technique for estimating technical efficiency and capacity utilisation. It is similar to SPF in that it estimates a frontier level of production and measures incapability and capacity utilisation as deviations from the frontier.'[30] Likely, when necessary data is available,

[23] Pascoe et al, above n 7, 42.

[24] Ibid.

[25] Ibid 47.

[26] Ibid 48; Tony J Pitcher, 'Rapfish, a Rapid Appraisal Technique for Fisheries, and Its Application to the Code of Conduct for Responsible Fisheries' (FAO Fisheries Circular No. 947, FAO, 1999) <ftp://ftp.fao.org/docrep/fao/005/x4175e/X4175E00.pdf> 1.

[27] Pascoe et al, above n 7, 48.

[28] Ibid 50; C T Hsu Timothy, 'Simple Capacity Indicators for Peak-to-Peak and Data Envelopment Analyses of Fishing Capacity - A Preliminary Assessment' in Sean Pascoe and Dominique Greboval (eds), *Measuring Capacity in Fisheries*, FAO Fisheries Technical Paper (FAO, 2003) vol 445, 314, 236.

[29] Pascoe et al, above n 7, 50; Andrew I L Payne, John Cotter and Ted Potter (eds), *Advances in Fisheries Science* (John Wiley & Sons, 2009) 37

[30] Pascoe et al, above n 7, 52; Payne, Cotter and Potter, above n 29, 37

DEA is favourable to be used as it has been applied in many fisheries, such as Malaysian purse seine fishery, United States Pacific salmon fishery, Northwest Atlantic sea scallop fishery and Atlantic coastal groundfish fishery.[31]

Although output-based measures provide a good estimate of capacity and capacity utilisation in fisheries,[32] they are not as useful for a number of current management schemes. It is because fisheries managers in several States (e.g., Thailand) have developed the measures that use capacity indicators mostly depending on the physical characteristics of the fishing vessels,[33] and have applied fishing capacity reduction programs according to these capacity measures,[34] or they are defined as input controls. The key indicators mainly used are gross tonnage (a measure of the vessel volume), the power of vessel engine, and the number of vessels. These measures are then defined as input-based measures of capacity. If the management system is not changed, the only way to reduce capacity under such system is to remove some inputs from the fishery, and thus the input-based measurement is essential.[35] As a result, both input-based and output-based measures are apparently needed in fisheries management. Furthermore, for a purpose of general comparison at international level, the FAO Technical Consultation on the Measurement and Assessment of Fishing Capacity has also suggested States to obtain their national fishing capacity estimates on both input and output basis.[36] However, distinguishing the relationship between these different measures is also a significant part of the management information system.[37]

4.2.1.3 Reference Point for the Management of Fishing Capacity

According to aforesaid sections, key quantitative indicators are measures of the current and potential fishing effort produced by the current fleet, and the current and potential catch that could be taken by such current fleet. Thus, the definitions of target level of

[31] Ibid.

[32] FAO, above n 3, 43.

[33] Ibid appendix H, I.

[34] Pascoe et al, above n 7, 35.

[35] Ward et al, above n 5, 16.

[36] Cunningham and Greboval, above n 4, 1.

[37] Ward et al, above n 5, 16.

capacity (e.g., fishing effort, catch or number of vessels) are required.[38] For the purpose of general comparisons at the global level, the FAO Technical Consultation on the Measurement and Assessment of Fishing Capacity has suggested that MSY (or fishing effort employed to catch MSY) should be adopted by all States as a common reference point for fishing capacity management at national and international levels.[39] However, there has been an argument that catching at the MSY level is still not safe as MSY is considered a semi-stable equilibrium. Harvesting below MSY is safer to the population of fisheries resources. Furthermore, catching at a rate proportional to stock size is also safer than catching a fixed amount of fish since all equilibriums are stable.[40] Therefore, some States (e.g., Australia) widely use MEY as a reference point of their harvest strategy. It is due to the fact that the equilibrium stock level associated with MEY is bigger than that associated with MSY for most cases. Then, theoretically MEY is more environmentally conservative than MSY.[41] Besides, at the MEY level, the sustainable catch or effort would generate the maximum profits. But, it is essential to note that in multi-species fisheries the reference point, either MSY or MEY, should be determined by considering the different biology and economic characteristics among species.[42]

4.2.2 Qualitative Indicators for Overcapacity

Clearly, to quantitatively determine capacity needs a great amount of information on a fishery or fisheries that may not be available, particularly in open access or regulated open access fisheries. Thus, subjective measures and qualitative indicators of overcapacity levels might be beneficial to fisheries managers in terms of capacity management.[43] Some remarkable qualitative indicators are summarised below.

Biological status of the fishery: In many States, stock assessments are undertaken for key species. These assessments basically have a purpose 'to estimate the stock

[38] Ibid 20.

[39] Cunningham and Greboval, above n 4, 2.

[40] Eleanor J Milner-Gulland and Ruth Mace, *Conservation of Biological Resources* (Blackwell Science, 1998) 49.

[41] Australian Fisheries Management Authority, *Harvest Strategy: For the Torres Strait Prawn Fishery* (2010) i.

[42] Department of Agriculture Fisheries and Forestry, *Commonwealth Fisheries Harvest Strategy: Policy and Guidelines* (2007) 31.

[43] Metzner, above n 2.

abundance and level of fishing mortality over recent years, and often predict yields and biomass in the short term based on assumptions about continuing levels of fishing effort'.[44] The advice, based on these assessments, is often provided to fisheries managers in terms of either target catch levels or effort levels of the fisheries. For instance, Japan has conducted stock assessments for seven commercially important species (i.e., saury, walleye Pollock, jack mackerel, sardine, mackerel, common squid, and snow crab) that contribute 35 per cent of annual catch landing in order to determine TACs of these species.[45] In general, the stocks are identified as overfished, fully utilised or underutilised based on a set of biological reference points.[46] If concerned species are overfished, then overcapacity almost certainly exists. It is because either overfishing or overcapacity is a consequence of similar management problem. However, although the biological state of a fish stock could be a reasonable and useful indicator of overcapacity, it must be applied appropriately.[47]

The ratio between total allowance catch (TAC) and the length of fishing season: TAC is basically defined as 'a catch limit set for a particular fishery, generally for a year or a fishing season.' TACs are generally set in tonnes of live-weight equivalent, but can also be set in numbers of fish.[48] The purpose of TACs is to prevent fishers to overexploit the resource. The 'race for the fish' where TAC is fully fished before the end of the fishing season, can be an indicator of overcapacity. In other words, the proportion of the level of TAC to the season length may be used as a qualitative indicator of overcapacity.[49] In case the season length reduced continuously for some years, this may also be used as an indicator of overcapacity. Although this is not a very

[44] Ward et al, above n 5, 22.

[45] Japan has considered the target species for TACs based on three criteria, including i) species that have catches in the top 30 ranking; ii) species that are considered overexploited; and iii) species that are caught by foreign vessels in Japan's EEZ. See, Irina Popescu and Toshihiko Ogushi, 'Fisheries in Japan' (European Parliament, December 2013) <http://www.europarl.europa.eu/RegData/etudes/note/join/2014/529044/IPOL-PECH_NT(2014)529044_EN.pdf> 25.

[46] Ward et al, above n 5, 22.

[47] Ibid.

[48] OECD, *Total Allowable Catch (TAC)* (18 November 2001) <http://stats.oecd.org/glossary/detail.asp?ID=2713>.

[49] Ward et al, above n 5, 23; FAO Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2004* (FAO, 2004) 121.

good one to indicate overcapacity, it could show the possibility of having overcapacity problem in such fishery.[50]

Latent permits: The trend of unused or latent permits or licenses in the fisheries is another indicator of overcapacity. These fishing permits or licences are issued to fishers but have never been used, or have been used earlier but are inactive now. The proportion of active permits to total permits (i.e., active and latent) could be applied as an indicator of overcapacity, that overcapacity potentially exists when a large ratio of latent permits to total permits, or a small ratio of active permits to total permits, is found.[51] This indicator is not perfect either, though.

Catch per unit of effort (CPUE): The appearance of a decrease of CPUE over time may suggest overfishing and, potentially, overcapacity,[52] such as the case of Thai marine fisheries.[53] But this CPUE indicator must be used carefully, as CPUE could be stable or increase for a schooling type of fish even though the abundance of such fish stock is decreasing. However, in a fishery, which TACs and catch level are quite stable, a decreasing trend in CPUE over a period of time possibly suggests overcapacity.[54]

Value per unit of effort (VPUE): When CPUE decreases, the VPUE will also decrease as the catch production decreases, potentially suggesting overcapacity.[55] But, there are also many circumstances where VPUE may decrease although CPUE is quite stable. For instance, an increased proportion of juvenile fish in catch composition, which generally have a lower price on the market due to their smaller size, will result in lower revenue per trip even if total catch remains quite constant.[56] This would be an indicator that the stocks are being overfished and excess capacity is likely to exist. In addition, the changes in species composition of the catch will affect the VPUE. Generally, fishers will try to catch the most valuable species first, a drop of VPUE, therefore, could suggest that these high valuable species had been depleted, and thus the less valuable

[50] Ibid.

[51] Ibid.

[52] Ibid 24; FAO Fisheries and Aquaculture Department, above n 49, 121.

[53] Details are discussed in Section 2.4 of Chapter 2.

[54] Ward et al, above n 5, 24.

[55] Ibid; FAO Fisheries and Aquaculture Department, above n 49, 121.

[56] Ward et al, above n 5, 24.

species had been caught instead. VPUE can be a useful indicator for highly mixed fisheries where catch weight of each species is difficult to record, but the total value of catches is possible to get.[57]

Apart from the indications abovementioned, there are other qualitative indicators for overcapacity that can be used. They include the ratio of harvest to target catch, the degree of conflict in a fishery over the catch allocation, decreased economic profits and increased fleet age.[58] It could be possible that these subjective measures may sometimes be the only feasible method to determine the estimates of overcapacity, and then using qualitative assessments depending on verifiable indicators could result in a better use of available information.[59] Nonetheless, it is clearly seen that no one indicator can be adequate to indicate overcapacity in a fishery. A set of combined indicators analysed over time is required to measure levels of qualitative capacity in fisheries.[60] It is also important to note that even when qualitative indicators suggest overcapacity at that particular time, they do not show either the intensity of such problem or the direction its change. Furthermore, the application of aforesaid indicators can be varied based on the expertise of the analyst.[61] Therefore, these qualitative indicators must be carefully used.

Currently, quantitative and qualitative methods of capacity assessment, as well as monitoring mechanisms are applied in many States due to the implementation of NPOA and regional plans of action on fishing capacity management.[62]

4.3 Standards and Measures for Fishing Capacity Management

When a fishery has confronted unacceptable levels of excess and overcapacity, the implementation of regulations to control fishing capacity in a short run and decrease fishing capacity in the long run needs to be implemented.[63] To achieve such goals, the

[57] Ibid.

[58] Metzner, above n 2.

[59] Ibid.

[60] Ward et al, above n 5, 22.

[61] Ibid 24.

[62] Metzner, above n 2.

[63] John M Ward and Rebecca Metzner, 'Fish Harvesting Capacity, Excess Capacity, and Overcapacity: A Synthesis of Measurement Studies and Management Strategies' (FAO, 2002) <ftp://ftp.fao.org/docrep/fao/005/y8169e/y8169e00.pdf> 74.

connection between fishing capacity and relevant perspectives of fisheries management, particularly the factors that influence fishing behaviour and fleet dynamics, need to be understood.[64] However, the existing legal framework for fishing capacity management both within the global and regional contexts mentioned in the previous chapter, clearly suggest for States to eliminate overcapacity or control fishing capacity at levels that are appropriate with the sustainable utilisation of fisheries resources. Nonetheless, they do not provide any explicit measures as solutions to manage fishing capacity in such circumstances. However, several measures or tools have been widely adopted as technical instruments used to control fishing capacity. This section clarifies and analyses these tools in order to provide a technical framework from which State or regional measures can be measured against. Additionally, the current implementations of such tools by Thailand are also examined.

In order to address the problem of overcapacity effectively, tools or measures should be used to manage the fishing fleet rather than fish stocks and correct incentives of fishers.[65] These measures can be categorised into three main groups, namely, incentive blocking measures, incentive adjusting measures and other relevant management measures. The first two groups consider how these measures change the incentives facing fishers,[66] whereas the last group includes other management measures that could be applied to control fishing capacity in indirect ways. Details of measures under each group are discussed in the following sections.

4.3.1 Incentive Blocking Measures

In fisheries where property right management systems are deemed not to be appropriate, such as in multi-species fisheries, explicit management systems for fishing capacity need to be introduced.[67] Put simply, they can be a set of policies and tools designed to control the fleet size or catch in order to achieve some desired level of exploitation.[68] Such tools are then called direct controls or incentive blocking measures as they aim to

[64] Rebecca Metzner, *Fisheries and Aquaculture Topics. Regulating Fishing Capacity. Topics Fact Sheets.* (27 May 2005) FAO <http://www.fao.org/fishery/topic/14857/en>.

[65] Cunningham and Greboval, above n 4, 15.

[66] Ward et al, above n 5, 25.

[67] Ibid 2.

[68] Ibid.

prevent the economic incentives, which are nature of open access fisheries and usually lead to the increase of fishing fleet capacity. These 'command-and-control' tools efficaciously limit the capability of the market to function.[69] Incentive blocking measures can be categorised into two subgroups, i.e., input regulations and output regulations.

4.3.1.1 Input Regulations

Input regulations, which could be referred to as physical measures,[70] are conceptualised on the assumption that if inputs are decreased, the resource will regenerate and lead to along-term increase in CPUE and in total catches. The expected results are the greater profit and the generation of resource rent.[71] Additionally, input control might ensure more effective compliance and improve social stability of the fishing communities.[72] The most significant input regulations are discussed as follows:

4.3.1.1.1 Limited Licensing

The objective of limited licence programs is to set a highest number or capacity of fishing units that are allowed to operate in a fishery[73] in order to control fishing mortality by restricting access to the fishery and ensure the conservation of stocks.[74] The licences that may be either transferable, or non-transferable, are granted by either giving or selling, to fishing units or fishers or companies. The fishing units include

[69] Ibid 26.

[70] FAO, above n 3, 44.

[71] Costs include all components employed to create an exploitation level in a fishery together with an accepted level of return on capital, and the resource rent is any income obtained in excess of this amount. Due to the fact that costs and prices vary, the resource rent is therefore not fixed but variable too. Resource rent does not only change over time, but also change depending on the level of fishing effort. See, Tim Bostock et al, *Fiscal Reform in Fisheries: 2. Resource Rent* (May) Overseas Development Institute <http://www.odi.org.uk/resources/download/2286.pdf>; Reasons to collect resource rent (also commonly known as economic rent) are including to ensure a return to the owner of a resource, avoid inefficient allocation, and achieve ethical objectives. See, Jim Sinner and Jorn Scherzer, 'The Public Interest in Resource Rent' (2007) 11(Journal Article) *New Zealand Journal of Environmental Law* 279.

[72] David Symes, 'Institutional Change and the Reform of Fisheries Management: Some Outstanding Questions' in David Symes (ed), *Alternative Management Systems for Fisheries* (Fishing News Books, 1999) 242, 184.

[73] Organisation for Economic Co-operation and Development, 'Synthesis Report for the Study on the Economic Aspects of the Management of Marine Living Resources' (AGR/FI (96) 12, OECD, 1996).

[74] John R Beddington and R Bruce Rettig, *Approaches to the Regulation of Fishing Effort* (FAO, 1984) 13.

fishing vessels and fishing gears. The number of fishers or capacity is then restricted by limiting the number of licences. The purpose of this scheme is mainly to control the increase of excess capacity.[75] Since this limited entry scheme was initiated to not favour the policy of incentive subsidisation for vessel construction and improvement, fishery industry did not usually support this scheme in the past.[76] Many States have implemented restricted-access programs through the forms of licensing.[77] For example, Australia has implemented the scheme of limited licensing as one of the main management tools in many fisheries, e.g., the Northern Prawn Fishery (NPF), the Western Rock lobster Fishery, and the South East Trawl Fishery (SEF).[78] In the United States, the Maryland Limited Entry Program for commercial fishing licenses was introduced through a delayed entry program that a new entrant had to register with the Maryland Department of Natural Resources two years before receiving a license to catch finfish, crabs, oysters, or clams.[79] A moratorium on new entrants of sea scallop fisheries is also put in place in the United States.[80] China has also attempted to reduce fishing effort by implementing a blanket moratorium in coastal waters.[81]

Often, variation of licensing programs reflects social, economic, and political environments.[82] For instance, due to unclear political decision in the European Union (EU) in terms of fishing capacity reduction, the two ways adopted by the EU Common Fisheries Policy (CFP) have been alternatively implemented to limit fishing effort,[83] i.e.,

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[75] Dominique Greboval and Gordon Munro, 'Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper No. 386 (FAO, 1999) 206, 26.

[76] Ibid.

[77] Symes, above n 72, 184.

[78] FAO, *Information on Fisheries Management in Australia* (October 2003) < http://www.fao.org/fi/oldsite/FCP/en/AUS/body.htm>.

[79] Maryland Department of Natural Resources, *Commercial Fisheries Licenses & Fees: Limited Entry for Commercial Fishing Licenses* (2012) <http://www.dnr.state.md.us/fisheries/commercial/license/limited.asp>.

[80] FAO, *Information on Fisheries Management of the United States of America* (February 2003) <http://www.fao.org/fi/oldsite/FCP/en/USA/body.htm>.

[81] FAO, *Information on Fisheries Management in the People's Republic of China* (November 2001) <http://www.fao.org/fi/oldsite/FCP/en/CHN/body.htm>.

[82] Beddington and Rettig, above n 74, 15.

[83] Based on article 3(h) of Council Regulation (EC) No. 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy, fishing effort is defined as fishing capacity x activity. Fishing capacity can be measured in terms of the number of licensed fishing vessels or the size (gross tonnage) or the power of engine (kW) of fishing vessels. Presently, the EU measures

(i) maintaining fishing effort (and/or fishing capacity) of certain fisheries at the present level or not beyond historic level;[84] and (ii) reducing fishing efforts until they reach precautionary levels and the levels that produce a long-term high yield.[85] However, these methods seem insufficient as the EU fishing fleets' capacity has been still increased over time.[86]

Since limited licensing schemes aim to protect the increase of excess capacity, when combining it with TACs schemes, the license limitation scheme will control the accumulation of excess capital. This outcome is similar with the consequence of applying TACs-only policy.[87] It is because TACs-only policy is focused on the rehabilitation of the resource only, and hence the conventional capital stock will be accumulated above the optimal level. It eventually results in significant overcapacity in fishing fleet and leads to economic waste. Thus, the TACs-only policy is not recommended as a measure to control fishing capacity.[88] However, when applying limited licensing with TACs, the licences allowed will equal a fixed number of fishing units (or fishers) that are able to harvest the specified TACs.[89] For example, the CFP sets TACs and fishing effort for fisheries on deep sea species every two years.[90] However, there might be difficulties confronted when implementing a TAC regulation system in multi-species and no discard fisheries. It is based on the fact that fishers within this system have incentives to misreport the catch to avoid penalties, which would consequently distort the information needed for biological advice.[91] Due to this constraint, a TAC regulation system is unlikely to be effectively implemented in multi-species fisheries such as tropical fisheries.

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fishing effort in terms of either GT days, or kW days. See, European Commission, *Fact Sheet: Fishing Effort* (2012) <http://ec.europa.eu/fisheries/documentation/publications/cfp_factsheets/fishing_effort_en.pdf>.

[84] This method has been implemented in the Western Waters and the Plaice Box in the North Sea. See, ibid.

[85] This method has been applied on other fisheries in EU. See, ibid.

[86] Sebastian Villasante and Ussif Rashid Sumaila, 'Estimating the Effects of Technological Efficiency on the European Fishing Fleet' (2010) 34(3) *Marine Policy* 720, 721.

[87] Greboval and Munro, above n 75, 21.

[88] Ibid, 21-2; Gary R Morgan, *Individual Quota Management in Fisheries - Methodologies for Determining Catch Quotas and Initial Quota Allocation* (Rome, 1997).

[89] Colin W Clark, *The Worldwide Crisis in Fisheries Economic Models and Human Behavior* (Cambridge University Press, 2006) 9.

[90] European Commission, above n 83.

[91] Symes, above n 72, 183.

The schemes of license limitation are generally applied by granting licenses to fishing units that rightfully claim in a fishery, either by their historical involvement in the fishery or by substantially investing in the fishery's development.[92] To reduce the licenses, there have been three main approaches to use. The first one, which is the simplest way, is attrition. This method, however, can be possible if the licences cannot be transferred.[93] Furthermore, it usually takes a long time to be effective and unlikely increase an economically efficient outcome. It could also be an issue of unfairness to future entrants.[94] The second approach, which is for only transferable licences, is to apply the regulations that ensure the reduction of capacity after transferring licences.[95]

The last approach, which is increasingly used in today's fisheries,[96] is to implement a buyback scheme. Typically, the goal of a vessel buyback scheme can be categorised into three main areas, i.e., social alteration, fleet rationalisation and conservation of fisheries resources.[97] This scheme is approached by authorities by purchasing licenses and vessels in order to remove them from the fishery and the fishing capacity will then be decreased.[98] But it is important to note that a buyback scheme applied when the incentives are still unaltered cannot achieve a purpose of long-term capacity reduction, as the capacity would be soon reversed.[99] In other words, a buyback scheme may decrease fishing capacity in a short period but as far as the incentives of open access fisheries continue, the improvement of stock abundance will still appear to fishers to create more fishing capacity in the fishery.[100] It is due to the fact that buyback program has actually renewed the economic incentives for fleet expansion. The owners of remaining licensed vessels tend to gradually increase the efficiency of their vessels in a

[92] Cunningham and Greboval, above n 4, 22.

[93] Greboval and Munro, above n 75, 22.

[94] Cunningham and Greboval, above n 4, 34.

[95] Greboval and Munro, above n 75, 22.

[96] Ward and Metzner, above n 63, 75; Daniel Holland, Eyjolfur Gudmundsson and John Gates, 'Do Fishing Vessel Buyback Programs Work: A Survey of the Evidence' (1999) 23(1) *Marine Policy* 47.

[97] Holland, Gudmundsson and Gates, above n 96, 59. For the goal of social adjustment, there are including transfer payments, such as disaster aid to the fishing industry or aboriginal rights. See, Ward and Metzner, above n 63; Dale Squires et al, 'Fisheries Buybacks' in R Quentin Grafton et al (eds), *Marine Fisheries Conservation and Management* (Oxford University Press, 2010) 507.

[98] Ward and Metzner, above n 63, 75.

[99] John Gate, Dan Holland and Eyjolfur Gudmundsson, 'Theory and Practice of Fishing Vessel Buyback Programmes ' (Paper presented at the UNEP/WWF Workshop on the Role of Trade Policies in the Fishing Sector, Geneva, 1997), in Greboval and Munro, above n 75, 23.

[100] Ward and Metzner, above n 63, 75.

process, which is termed as 'capital stuffing'.[101] The examples of capital stuffing include increased engine horsepower, improved navigational systems, upgraded fishing gears, increased freezer capacity,[102] and increased length or breadth of vessels.[103] As a result, these improvements can, over time, substantially increase the fishing capacity of total fleet, and a new buyback program would then be necessary.[104] Therefore, to effectively use a buyback scheme, it must ensure that the proper buyback programs are designed and removed fishing capacity will not return to the system, so that the buyback does not result in an expensive transfer payment program.[105]

Currently, many States have implemented buyback programs with huge amounts of money allocated, including Australia, Japan, the European Community, the United States, Canada, Norway, Taiwan, and Malaysia.[106] For instance, Australia allocated AUD150 million (USD160 million)[107] for a one-off fishing concession buyout to approximately 800 Commonwealth fishing concessions in 2006.[108] Malaysia reserved MYR28.8 million (USD9.6 million)[109] for the compensation paid to the owners of 16,051 small vessels and mini trawlers, which were bought out of the fishery industry.[110] Canada spent about USD1.88 billion for a vessel buyback program (VMP) in order to control the catch of pelagic fish in the Atlantic,[111] whereas Norway allocated about NOK230 million (USD41.07 million) for VMP.[112]

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[101] Clark, above n 89, 3.

[102] Ibid.

[103] Ward and Metzner, above n 63, 75.

[104] Clark, above n 89, 3.

[105] John Walden, James Kirkley and Rolf Fare, 'Measuring and Managing Fishing Capacity' in R Quentin Grafton et al (eds), *Marine Fisheries Conservation and Management* (Oxford University Press, 2010) 546.

[106] Ward and Metzner, above n 63, 75.

[107] At AUD0.94 = USD1 as of 2014. The succeeding conversions are based on 2014 exchange rates, rounded off to the nearest THB and USD.

[108] Monica Minnegal and Peter D Dwyer, 'Mixed Messages: Buying Back Australia's Fishing Industry' (2008) 32(6) *Marine Policy* 1063.

[109] At MYR3 = USD1 as of 2014.

[110] Mohd Ibrahim Hj Mohamed, 'National Management of Malaysian Fisheries' (1991) 15(1) *Marine Policy* 2, 6.

[111] FAO, 'Report of the National Seminar on the Reduction and Management of Commercial Fishing Capacity in Thailand. Cha-Am, Thailand, 11-14 May 2004.' (FIP/FCR13, FAO, 2005) <http://www.fao.org/docrep/008/j6419e/j6419e00.htm> 49.

[112] Ibid 50.

Clearly, based on experiences to date, it is difficult to achieve the goal of fishing capacity reduction by applying the licence limitation scheme, particularly buyback program, without being prohibitively expensive.[113] It has been identified that a cause of overcapacity in fleets is due to the non-malleable nature of capital. The flexibility of large vessels, which usually have specific gears, is achieved through opportunistic fishing activities in any oceans of the world. Lay-up is costly alternative.[114] On the contrary, fishing areas of small-scale fishing vessels are confined and it is not expensive in changing their fishing gears or lay-up. Thus, there is more possibility to successfully mitigate overcapacity problem if applying this license limitation scheme with small-scale fisheries. This particular scheme, however, can be more fractious due to socio-economic conditions[115] based on the fact that small-scale fisheries are mainly for livelihood, not for commercial purposes. Furthermore, if targeting to remove only legally registered vessels out of the fisheries, the effect of this measure on capacity reduction might not be significant.[116] Therefore, the appropriate design of limited entry schemes remains important for capacity control in fisheries.

Overall, the desirable outcome of a limited licensing scheme will depend on the degree of scheme's restrictiveness and the intensity of complexity of the fishery.[117] But, it is important to note that the more restrictive the scheme, the more expensive it is to apply.[118] Furthermore, a limited licensing scheme does not provide an incentive to fishers to avoid overcapacity as the remaining fishers still tend to develop their capacity to maximise their fishing.[119] This scheme by itself is not adequate to address overcapacity issue, and therefore other measures, particularly those concerning fishing rights,[120] are required to limit the increased rate in capacity, which can be the forms of

[113] Cunningham and Greboval, above n 4, 34.

[114] Christopher Newton, 'Review of Issues for the Control and Reduction of Fishing Capacity on the High Seas' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper (FAO, 1999) vol 386, 206, 62.

[115] Ibid.

[116] FAO, above n 111, 51.

[117] Ralph E Townsend, 'Entry Registrations in the Fishery: A Survey of the Evidence' (1990) 66 *Land Economics* 359; Greboval and Munro, above n 75, 20.

[118] Greboval and Munro, above n 75, 25.

[119] Cunningham and Greboval, above n 4, 27.

[120] FAO, above n 111, 52.

capital stuffing or changes of fishing seasons or areas.[121] Otherwise, the threat to resource conservation will constantly remain.[122]

There is a situation where this scheme could curb the fishers' incentives in depleting the stock. It is where license holders, particularly within a small group, agree to adopt their own management measures, which remove the need to race for the fish among them. But with this kind of arrangement, the fishers need to cooperate and build trust between one and another, as well as need a mechanism, either formal or informal, to enforce the agreed measures. In order to encourage cooperative behaviour among fishers, it may then be feasible to establish limited licensing programs over small fishing areas.[123]

4.3.1.1.2 Limited Licensing in Thailand's Context

Due to the drastic decline of marine resources in Thai waters, particularly in the Gulf of Thailand, in the past decades, the Department of Fisheries has attempted to address this decline by implementing a limited licensing scheme to cut down fishing capacity in Thai fisheries. To achieve this goal, the Department of Fisheries has suggested that eliminating a number of push netters and trawlers would be the most desirable approach to generate the positive impact on marine resources.[124] This suggestion was given due to the fact that these fishing gears are considered highly destructive fishing gears because they catch big amounts of fish juveniles and destroy seafloor ecosystem, such as corals and sea grasses.[125]

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[121] Ward and Metzner, above n 63, 75.

[122] Greboval and Munro, above n 75, 25.

[123] Cunningham and Greboval, above n 4, 27.

[124] Theo Ebbers and Rick Gregory, 'Capacity Development for Improving the Knowledge Base for Fisheries Management in Southeast Asia - a Regional Initiative, Implemented Locally' (APFIC Ad Hoc Publication, FAO Regional Office for Asia and the Pacific, 2009) <http://www.apfic.org/uploads/wfd_124079351849f50185b51a1--capacity.pdf> 13.

[125] Some of the most common fishing gears have been known to have damaging impact on the resources, the deep sea marine habitat, and the broader marine environment, such as bottom trawling (including dredgers and scrapers). See, Serge M Garcia, *World Inventory of Fisheries. Destructive Fishing Practices. Issues Fact Sheets.* (27 May 2005) FAO <http://www.fao.org/fishery/topic/12353/en>. However, in a fisheries management perspective, a wider and more useful definition of destructive fishing practices could cover overfishing exceeding reasonable recovery limits, destroying a large amount of bycatch, and extremely fishing in important habitats, such as spawning and nursery grounds. See, Jon Nevill, *Destructive Fishing Practices: Definitions* (28 March 2007) <www.tucs.org.au/~cnevill/marineDFP_definitions.doc>.

Push nets, which were modified from marine shrimp nets used by hands since 1967, were not required to be registered until 1970.[126] Since then, push nets were greatly developed both in number and effectiveness. As a result, marine resources and environments have been increasingly destroyed. To address this problem, the Thai government through the Department of Fisheries has controlled the number of push netters by firstly stopping the issuance of the fishing licenses to new participants in order to freeze numbers at the current level, and later implementing push net reduction programs, buyback programs in particular. The Department of Fisheries has started buyback programs of push netters in 1997 and conducted quite a number of programs over time (Table 4.2). During the period 1997-2003, the Thai government allocated THB19,310,388 (USD603,450) for compensation to push net fishers, who voluntarily changed to use less destructive fishing gears or conduct aquaculture.[127] These efforts, however, unlikely achieved the desired outcome as the number of push netters was not reduced.

The Department of Fisheries made a further attempt by implementing another buyback program for push netters in Ranong Province under the Fishery Resource Rehabilitation Project. Under this program, more than THB19 million was spent for compensation to about 1,300 push netters, who voluntarily quitted from push net fisheries.[128] These fishers were required to sign an agreement with the Department of Fisheries stating that they would not return to push net fisheries in the future.[129] This project has been considered as the biggest push net reduction program conducted by the Thai government. Apart from government sector, private organisations, such as Rotary International, also provided some funds to support push net fishers who voluntarily left push net fisheries for environmentally friendly careers.[130]

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[126] FAO, above n 111, 38.

[127] Mala Supongpan, *Direction and Challenges in Reducing Capacity of Trawlers and Push Netters in the Gulf of Thailand* (21 September 2011) <http://www.apfic.org/uploads/smartsection/369_Fisheries_management_Thailand.pdf>.

[128] Ebbers and Gregory, above n 124, 44.

[129] Ibid.

[130] The Rotary International provided THB1.0 Million through Provincial Fisheries Office for the project supporting the alteration of fishing gears and fishing careers to fishers in Ranong Province who were affected by Tsunami attack in 2004. See, Manager Online, 'ประมงอวนรุนระนองทนพิษน้ำมันแพงไม่ไหวหันเลี้ยงสัตว์น้ำชายฝั่งแทน [Push Net Fishers in Ranong Province Shifted to Aquaculture Sector Because of the High Cost of Fuel]', 6 September 2005 <http://www.nicaonline.com/webboard/index.php?topic=2901.0>.

Table 4.2: Push net reduction programs implemented by Thailand during 1997-2003

Year	Province	Number Quit	Budget (THB)	Substituted Fishing Gears and/or Careers
1997	Songkhla	45	39,120	Trammel net, shrimp trap
	Phuket	60	1,627,350	Shrimp gill net, cockle culture, trammel net
1998	Phuket	10	879,680	Fish cage culture
	Phang-nga	65	1,109,000	Cockle and oyster culture
	Satun	59	240,000	Trammel net, snapper gill net, sand whiting gill net
	Krabi	20	80,000	Trammel net
	Pattani	62	1,260,000	Trammel net, swimming barb gill net
1999	Satun	53	276,620	Trammel net
	Ranong	107	2,280,000	Trammel net and fish cage culture
2000	Trang	157	1,620,000	No information
2001	Krabi	76	815,000	Weighted fish net, Indo-Pacific gill net, trammel net, bamboo stake trap
2002	Satun	22	493,974	Trammel net, grouper culture, mussel culture (hanging type), mud crab trap, soft shell crab, white snapper culture
	Ranong	58	759,010	Mussel culture (hanging type), mud crab trap, soft shell crab, white snapper culture
	Phuket	40	920,337	Bottom long line, weighted fish net, sardine gill net, red snapper culture
	Trang	140	2,513,517	White snapper and grouper culture, crab gill net
2003	Chumphon	30	96,400	Increase mesh size of crab trap
	Ranong	15	360,600	Fish cage culture, e.g., red snapper cage culture
	Phang-nga	91	300,000	Increase mesh size of crab trap
	Satun	151	2,832,700	Set net, red snapper cage culture, crab trap
	Trad	11	35,000	Increase mesh size of crab trap
	Nakhon Sri Thammarat	40	420,000	Gill net
	Total	1,312	19,310,388	

Note: At THB32 = USD1 as of 2014.

Source: Mala Supongpan, Direction and Challenges in Reducing Capacity of Trawlers and Push Netters in the Gulf of Thailand (21 September 2011) <http://www.apfic.org/uploads/smartsection/369_Fisheries_management_Thailand.pdf.

Although it is clearly seen that the Thai government has put great efforts to eliminate the capacity of push netters in Thai fisheries by implementing a lot of reduction programs, the number of push netters is unlikely decreased. This could mainly be because there was no explicit follow up activities to monitor whether these push netters participated in the programs would really stop or change to use less-destructive fishing gears or conduct other alternate careers as they stated. Additionally, all of the reduction programs were established on a voluntary basis, and thus no fines or penalties were imposed on push netters who reneged on the agreement. Besides, Thailand had never established any systematic plan of action for fishing capacity management at the national level. This critical deficiency of essential mechanisms also contributed to the unsuccessful results of capacity reduction programs in Thailand.

Therefore, in 2006 the Department of Fisheries, with assistance from FAO, put a great attempt to form a policy framework and plan of actions in managing fishing capacity, focusing on the capacity reduction of trawlers and push netters in the Gulf of Thailand.[131] This project was conducted through consultation process among stakeholders in order to consider the findings from background studies, discuss their implications, and seek recommendations that could be used to reduce fishing capacity in the Gulf of Thailand.[132] The consultation process consisted of a series of actions, including (i) clarifying target groups/stakeholders that should be covered in consultation process. The stakeholders included trawl and push net owners and crews, small-scale fishers, government officers, university academics, regional organisation (e.g., SEAFDEC) and representatives from fishery processing industry (e.g., canned fish company); (ii) conducting opinion poll on trawler and push net reduction with identified stakeholders; (iii) conducting stakeholder consultations.[133] Stakeholders were provided information about alternative employment in coastal areas for labors leaving the fishery;

[131] It was under the FAO project titled "Strengthening the Capacity in Fisheries Information Gathering for Management" (FAO/GCP/RAS/199/SWE). This project was financially supported by the Swedish International Development Cooperation Agency (Sida). It provided the framework and the necessary financial support for this initiative implementation. This project was 'designed to contribute to FAO's long-term strategic goal of changing national and regional perceptions of how fishers can be effectively incorporated into fisheries management mechanisms. The project's development objective encapsulated this strategic goal and was stated as, enhanced management of fisheries resources through effective decision-making and policy development, based upon appropriate information and facilitation of stakeholder dialogue.' See, Ebbers and Gregory, above n 124, 1-2.

[132] Ibid 47.

[133] The consultations were conducted based on four areas of the Gulf of Thailand, i.e., the Eastern, Inner, Upper Southern and Lower Southern Gulf of Thailand. See, ibid 44.

(iv) conducting consultation for decision-maker on follow-up actions needed to be taken;[134] (v) taking follow-up actions by Department of Fisheries, as well as conveying the outcome of consultations to broader groups of stakeholders.[135] According to the results of decision-maker consultation, small push netters, which severely destruct marine resources and environments of coastal areas[136] and, among other sizes of vessels, gain less profit, were agreed to be the first to be decommissioned.[137]

In 2007, the Department of Fisheries has taken this recommendation by putting a project of capacity reduction of push net and trawl fisheries in the action plans under the Master Plan on Marine Fisheries Management of Thailand. There were 320 fishing vessel crew members and 388 vessel owners from push net and trawl fisheries that were willing to leave such fisheries at that time.[138] Nonetheless, the project was not pursued until the Master Plan was officially implemented in 2009.

Under the Master Plan, the measurement plan of fishing capacity reduction was put under the first Strategy, namely the Strategy on Efficiency Enhancement of Marine Fisheries Management System and Co-Management. This measurement plan aims to control overall fishing capacity at the level that is commensurate with the prevailing conditions of fish stocks.[139] To achieve such goal, a number of projects were carried out, including the projects on: (i) the development of handling online system for marine fishing licenses, covering all types of fisheries at district level;[140] (ii) the study on optimum fishing capacity (i.e., number of fishing vessels) as at the commensurate level with the current conditions of fish stocks;[141] (iii) the survey for the actual number of marine fishing vessels operating in Thai fisheries;[142] (iv) the reduction program of

[134] The decision was made by considering the information of fishing livelihoods and related issues of the Gulf of Thailand. These findings helped to prioritize the type of gears and size of vessels that should be removed from Thai fisheries in order to address overcapacity problem effectively.

[135] Ebbers and Gregory, above n 124, 47.

[136] Small push netters destroy marine benthos and catch the big amount of trash fish which is mostly composed juveniles of economically important species, due to the nature of their practice in coastal areas. See, ibid 47.

[137] Ibid.

[138] Ibid 49.

[139] *The Master Plan*, strategy 1, measure 4.

[140] *The Master Plan*, strategy 1, measure 4, project 1.

[141] *The Master Plan*, strategy 1, measure 4, project 2.

[142] *The Master Plan*, strategy 1, measure 4, project 3.

trawlers; (v) the layoff of push netters; and (vi) the encouragement and development of alternative livelihoods for fishers. The alternative careers that have been supported by the Department of Fisheries include aquacultures (e.g., blue swimming crab culture) and fish processing.[143] Four hundred people from fisheries communities are aimed to have training in aquaculture under this project.[144]

The project of trawler reduction aims to reduce at least 234 trawlers annually, whereas the project on the layoff of push netters targets to decrease at least 74 push netters every year.[145] The layoff of push netters has turned out well as the project's target was hit. For example, in Trad Province alone, fifty fishers have voluntarily left push net fisheries, and now use less destructive fishing gears, e.g., fish gill nets, crab gill nets, shrimp trammel nets.[146] However, it is essential to note that the effective cooperation among government agencies (within the same and between different Ministries) and the private sector (e.g., fishers, fisheries communities and fisheries organisations) are critically required to prolong this successful outcome. Thus, unless sound arrangements have been made, it is quite challenging to achieve such goal.

For trawl fisheries, on the other hand, there was none of explicit reduction program conducted by the Thai government. Although there have been the attempts made by the Department of Fisheries in the past decades (e.g., in 1980, 1982, 1989, 1996)[147] to limit the number of registered trawlers by freezing it at the current level and not opening for new registries, these initiatives have not achieved success. It was because after such arrangements were announced by the Department of Fisheries, there were always protests made by trawl fishers and fisheries industries which were directly impacted. Due to this social pressure, and often together with political pressure, the Department of

[143] *The Master Plan*, strategy 2, measure 3, project 4-6.

[144] *The Master Plan*, strategy 2, measure 3, project 6.

[145] *The Master Plan*, strategy 1, measure 4, project 4-5. For each project, key performance indicators have been set to assess the success of project implementation.

[146] These substituted fishing gears are initially supported by the Department of Fisheries. See, Office of Secretary Department of Fisheries, 'กรมประมงนำมาตรการเปลี่ยนวิถีประมงอวนรุนแก้ไขปัญหาทรัพยากรสัตว์น้ำเสื่อมโทรม [Department of Fisheries Implemented the Measure on Changing Push Net Fisheries in order to Solve the Problem of Depleted Marine Resources]' (2012) <http://www.fisheries.go.th/fish/pr/news_detail.php?news_id=366>.

[147] Supaporn Anuchiracheeva, 'การนิรโทษกรรมเรือประมงอวนลากเถื่อน : อีกครั้งของความล้มเหลวในการจัดการประมงทะเลไทย [The Amnesty for Illegal Trawlers: An Repeated Failure of Marine Fisheries Management in Thailand]', *Manager Online* 26 May 2012 <http://www.manager.co.th/South/ViewNews.aspx?NewsID=9550000064806>.

Fisheries has unavoidably granted amnesties to unregistered trawlers (and thus illegally operating in Thai waters), as well as allowed them to register to become legal fishing vessels before the new registration was closed. The amnesties were granted based on the reason that having such vessels registered and become part of national records would result in obtaining the actual number of fishing vessels operating in Thai fisheries, trawlers in particular. This number would be beneficial in managing overall fishing capacity in Thai waters.

The most recent attempt in granting amnesty to unregistered trawlers was made in 2012. This amnesty, however, aimed to allow 2,107 unregistered trawlers to become legal fishing vessels, so that the fish caught by these vessels could be exported to the EU. It is due to the IUU Regulation imposed by the EU, stating that 'only marine fisheries products validated as legal by the relevant flag State or exporting State can be imported to or exported from the EU'.[148] The government claimed that this arrangement would not affect the state of marine resources in Thai waters as there are still some rooms for the fleet expansion.[149] Unsurprisingly, this attempt has been very controversial in Thai fisheries society, particularly among small-scale fishery communities. Small-scale fisheries organisations, together with academics, have strongly argued that trawlers are always considered as highly destructive fishing gears, thus government authorities should eliminate illegal trawlers instead.[150] Due to these big protests, the proposal in granting such amnesty has been suspended by Parliament.[151] This incident affirms the difficulty in balancing national interests, between supporting livelihoods of local fishers and increasing national incomes from exportation of fishery products.

Apart from the aforesaid capacity reduction programs, the Thai government has imposed a regulation to control capacity of some types of fishing gears used for

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[148] European Commission, *Illegal fishing (IUU): The EU Rules to Combat Illegal, Unreported and Unregulated Fishing* (26 November 2014) <http://ec.europa.eu/fisheries/cfp/illegal_fishing/index_en.htm>.

[149] Natdanai Maison, 'กสม. สอบกรมประมงนิรโทษกรรมอวนลาก ซ้ำเติมประมงพื้นบ้าน [NHRC Reviews the Amnesty Made by the Department of Fisheries Whether It Worsens Small-scale Fisheries]', *Isra News* 31 July 2012 <http://www.isranews.org >.

[150] 'เครือข่ายรักษ์ทะเล ค้านกรมประมงผ่อนผันจดทะเบียนอวนลากผิดกม. [The Network of Marine Conservations Protests the Amnesty Granted to Illegal Trawlers by the Department of Fisheries]', *Isranews* 19 July 2012 <http://www.isranews.org/community-news>.

[151] 'ยิ่งลักษณ์" ยก 10 เรื่องเดือดร้อน จี้กระทรวงเกี่ยวข้องเร่งแก้ [Yingluk Raises 10 Hot Issues for Assigned Ministries to Quickly Solve] ', *Daily News* 19 June 2012 <http://www.dailynews.co.th/Content/politics>.

anchovy fisheries, i.e., falling nets or lift nets with electricity generators and surrounding nets operating at day time.[152] This regulation allows only the operation of such gears which are previously registered (no new licenses granted) in order to protect anchovy stocks from overexploitation. This regulation seems to be the only legislation clearly imposed on fishing capacity of a particular fishing gear in Thai fisheries. It does not indicate the quantity of fishing capacity (e.g., number of fishing gears) that is permitted though.

However, no limited licensing scheme is applied on small-scale or artisanal fishing gears used in coastal areas of Thailand. It is basically because these gears are used to fish mainly for livelihood, and fishing licenses of these fishing gears are not legally required. Thus, there is no control on the enormous number of small-scale fishing gears and vessels in Thai fisheries, which could possibly harm the state of fisheries resources in coastal areas. For example, a great number of collapsible crab traps is increasingly deployed within conservation zones (3,000 metres from shoreline) as this gear is considered small-scale, and allowed to use in such area. As a result, this excessive fishing has gradually overexploited the crab population in the areas, by 10 per cent more than the carrying capacity. Furthermore, a lot of immature crabs have been harvested, which can eventually deplete parent stocks.[153]

Overall, it can be seen that the attempts made by Thailand to limit entry into the fisheries are inadequate as the number of fishing vessels operating in Thai waters has not reduced, and some fishing gears bought out from fisheries have returned to operate due to the lack of enforcement or appropriate alternative livelihoods. The urgent task for Thailand is therefore to implement more effective licensing programs. For instance, in large-scale fisheries, only fishing vessels that have registered and been granted fishing license, are allowed to operate in Thai waters with no exceptions. Strengthening enforcement is also an important key to improve the effectiveness of this scheme.

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[152] Notification of the Ministry of Agriculture and Cooperatives Re: Determining the use of certain kinds of fishing appliances in fisheries, given on 1 February B.E. 2543 (2000).

[153] Supaporn Anuchiracheeva, 'ธนาคารปูม้าชุมชน: นวัตกรรม และภูมิปัญญาในการฟื้นฟูทะเลไทยของชาวประมงพื้นบ้าน [Community Crab Bank: Innovation and Local Knowledge of Artisanal Fishers in Marine Resources Rehabilitation]', *Manager Online* 18 June 2012 <http://www.manager.co.th/South/ViewNews.aspx?NewsID=9550000074417>.

4.3.1.1.3 Individual Effort Quota

Individual effort quotas (IEQs) set a maximum on the amount of effort that each producer can apply to the fishery during a year. Effort units are defined as the amount of time that each unit of fishing gears use per year.[154] If the gear is mobile, its effort is defined as the amount of fishing time. It can be expressed as fishing days or trips. But if the gear is fixed, the limitation on the number of units is applied instead (e.g., pots, traps).[155] The initial allocation of IEQs can be limited by various mechanisms, such as historic catch levels or vessel size.[156] IEQs may or may not be transferable.[157] Where IEQs are transferable, they can be bought or sold by fishers.[158] Since this measure ignores productivity of gear units, the effect of this measure depends on the link between effort and catch, whether it is fixed. If such connection is flexible, fishers will try to increase the catch production by raising productivity of their gear units or fishing time.[159] Therefore, this measure will be effective if there is an explicit and inflexible link between effort and catch, and if effort can be clearly defined.[160]

But, IEQs are generally capable to slightly block capital stuffing or the race for the fish.[161] It is because input substitution, which is common occurrence under IEQ programs, would be likely to undermine the effectiveness of this measure just as it also would with limited licence programs.[162] For example, while fishing days remain the same, the operating power of a fishing vessel can be increased by replacing other factor inputs, such as modernised navigational systems, increased engine horsepower or improved fishing gears. The fleet capacity can then be increased over the long run.[163] Thus, to achieve a chance of success, the IEQs must be combined with restrictions on

[154] Symes, above n 72, 184.

[155] Greboval and Munro, above n 75, 27.

[156] Committee to Review Individual Fishing Quotas National Research Council, *Sharing the Fish:Toward a National Policy on Individual Fishing Quotas* (The National Academies Press, 1999) 118.

[157] Symes, above n 72, 184.

[158] Ward and Metzner, above n 63, 76.

[159] Greboval and Munro, above n 75, 27.

[160] Cunningham and Greboval, above n 4, 38.

[161] Organisation for Economic Co-operation and Development, above n 73.

[162] Cunningham and Greboval, above n 4, 38.

[163] Ward and Metzner, above n 63, 76.

the number of harvesters (e.g., limited licensing) or TACs,[164] otherwise there would be no control imposed on total potential effort.[165] But the enforcement might be difficult and costly since the fishing effort is operated away from fishing port and regulations could be avoided hence.[166]

IEQs, however, have been widely implemented in some States, such as the United States.[167] One of the oldest individual harvest quota programs in the United States is the Florida spiny lobster trap certificate program (TCP), which has been implemented since 1992. This program aims to decrease the total number of traps in order to increase CPUE and then maintain or increase overall catch of spiny lobster fisheries.[168] Under the TCP, commercial fishers, who are licensed, will hold certificates that allow them to use an equivalent number of traps. The initial certificates were allocated according to the recorded number of traps used during 3-year period before the TCP started. The total number of certificates or the total effort level is specified by the Florida Fish and Wildlife Conservation Commission.[169]

4.3.1.1.4 Individual Effort Quota Scheme in Thailand's Context

Thailand has not had any IEQs implemented in their fisheries. It could be mainly because of the high complexity of Thai fisheries, which are multi-fisheries type. This means one fisher or one fishing vessel can have or operate with more than one type of fishing gears. Furthermore, one target species can be captured by many types of fishing gears, both small-scale and large-scale fishing gears. Besides, fishing gears or fishing vessels can be used in any areas of Thai waters as long as they do not conduct illegal fishing. Taking these factors into account, to effectively implement individual effort quota scheme in Thai fisheries would need to overcome a number of difficulties, particularly in terms of determining the total allowable effort for each fishing gear and

[164] Greboval and Munro, above n 75, 27.

[165] Cunningham and Greboval, above n 4, 38.

[166] Ward and Metzner, above n 63, 76.

[167] Committee to Review Individual Fishing Quotas National Research Council, above n 156, 118.

[168] Sherry L Larkin and J Walter Milon, 'Tradable Effort Permits: A Case Study of the Florida Spiny Lobster Trap Certificate Program' (Paper presented at the IIFET 2000: Microbehavior and Macroresults, 2000) <http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/30630/136.pdf?sequence=1> 1.

[169] Ibid 2.

developing a proper design of effort quota allocations that would vary based on the types of fishing gears, and providing the adequacy of enforcement for such complicated fisheries of Thailand.

4.3.1.1.5 Gear and Vessel Restriction

Gear and vessel restrictions include measures that aim to reduce or curb the fishing effort productivity of individual fishing units.[170] The measures can limit the dimension of vessels and number of crews, as well as restrict the catchability of fishing gears[171] by limiting the number and size of gears, such as length of gill nets, number of hooks, pots, or traps. In addition, this regulation may apply to entirely ban the use of certain gears and equipment.[172]

Mesh size regulations and gear restrictions are very similar in their effects.[173] Both of them are used to reduce fishing pressure on juvenile stocks, as well as to provide an opportunity to such stocks to grow in size.[174] If combined with TACs, however, these regulations are expected to slightly mitigate the capital stuffing. They do not make big changes because fishers try to avoid the regulations by substituting their factor inputs. For example, vessel length restrictions can be evaded by lengthening the beam of a vessel or increasing the horsepower of vessel's engine.[175] Furthermore, these restrictions might raise questions in terms of economic impact.[176] It is because they might decrease profitability in the short run[177] since catch rates will immediately drop after applying mesh size regulations.[178] In the case of long-lived species with a low

[170] Ward and Metzner, above n 63, 75.

[171] Catchability is the proportion of a fish stock taken by a unit of fishing effort. Therefore, catchability is a measure of fishing gear's efficiency. See, Daniel D Hoggarth et al, *Stock Assessment for Fishery Management: A Framework Guide on the Stock Assessment Tools of the Fisheries Management Science Programme (FMSP)* (FAO, 2006) 59.

[172] Symes, above n 72, 242.

[173] Organisation for Economic Co-operation and Development, above n 73.

[174] Cunningham and Greboval, above n 4, 39.

[175] Ward and Metzner, above n 63, 76.

[176] Cunningham and Greboval, above n 4, 38.

[177] Ibid 39.

[178] Beddington and Rettig, above n 74, 12.

mortality rate, the benefits from this scheme might possibly occur after several years.[179] Besides, such benefits in terms of increased yields to fishers are difficult to detect.[180]

Mesh size restrictions are commonly imposed on trawl fisheries. However, in multi-species fisheries, both in tropical areas (e.g., Malaysia and Indonesia) and other areas (e.g., Australia[181]), a great concern in mesh size regulations, on trawlers in particular, has been raised. It is due to the fact that trawlers in such areas typically catch a large number of species and each species would have different optimum mesh size. Thus, a single mesh size could be sub-optimal for the majority of species.[182] As a consequence, it is important to ensure that the mesh size used is not too small; otherwise this will increase the proportion of juveniles in the catch and could eventually deplete the fish population.

Apart from trawl fisheries, gear and vessel restrictions are also applied on other fisheries. For example, Australia has imposed this scheme on the Northern Prawn Fishery and the Eastern tuna and billfish fishery.[183] The United States has implemented a regulation to control fishing effort on sea scallop fisheries in the northeastern areas by imposing a larger mesh-ring size of dredges,[184] which likely contribute to the success of the management measures on sea scallops as they have not been overfished.[185]

4.3.1.1.6 Gear and Vessel Restriction Scheme in Thailand Context

Gear and vessel restrictions are one of the main regulations applied in Thai fisheries. The dramatic increase in the number of large-scale fishing vessels over the past three decades, from approximately 5,000 fishing vessels in the 1960s to approximately 20,000 fishing vessels in the 1980s, has primarily caused the Thai government to

[179] Ibid.

[180] Ibid.

[181] Lisa Elliston et al, *Economic Efficiency in the South East Trawl Fishery* (2004).

[182] Beddington and Rettig, above n 74, 13.

[183] FAO, above n 78.

[184] FAO, above n 80.

[185] NOAA Fisheries, *Atlantic Sea Scallop* <http://www.greateratlantic.fisheries.noaa.gov/sustainable/species/scallop/>.

impose fishery regulations, particularly gear and vessel restrictions, for the purpose of minimising the impacts of large-scale fisheries on small-scale fisheries.[186] The incidents regularly found are that trawlers and push netters come to operate within inshore areas, which are the main fishing grounds of small-scale fisheries, e.g., crab traps and gill nets. Thus, these large-scale fishing vessels not only take the fish out from the areas but also damage such small-scale fishing gears deployed in the same areas. Unavoidably, fisheries conflicts have been arisen.

In an attempt to address this issue at the national level, the Thai government, through the Ministry of Agriculture and Cooperatives, has promulgated a number of Notifications to determine the areas in which trawls and push nets employed with motor vessels are banned. These include areas within 3,000 metres from the coast line and 400 metres surrounding the stationary fishing gears.[187] The necessity of this regulation is not only because trawlers and push netters are highly destructive fishing gears but also these areas are recognised as nursery grounds of aquatic animals, such as fish and invertebrates. However, the scientific evidence obtained from recent studies by the Department of Fisheries suggest expanding conservation zone from three kilometres to three nautical miles in order to cover the actual nursery grounds of aquatic animals.[188] This recommendation has unsurprisingly raised controversial responses from large-scale fisheries, particularly trawl fisheries as they usually fish in coastal areas. A series of consultation meetings among stakeholders including small-scale and large-scale fishers, government officers from relevant authorities, and academics were then arranged to resolve this issue. Finally, based on the solid technical evidences on the current status of marine resources in Thai waters, the regulations that prohibit trawls and push nets employed with motor vessels to operate in the areas within three nautical miles (or 5,556 metres) from the coast line have been imposed in the areas of nine coastal provinces of Thailand.[189] These provinces include Trang,[190] Krabi,[191] Prachuab

[186] Plodprasop Suraswadi, 'Community-based Fisheries Management in Phang-nga Bay, Thailand' (Paper presented at the National Workshop on Community-based Fisheries Management, Phuket, Thailand, 14-16 February 1996) 45.

[187] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of Areas in which Fishing Appliances, i.e., Trawls, and Push Nets used with Motor Vessels, are Prohibited, given on 20 July B.E. 2515 (1972). Notification(s) of the Ministry of Agriculture and Cooperatives, hereinafter referred to the Notification(s).

[188] Wirat Sanitmajjaro et al, *Marine Resources in 5 Nautical Mile Inshore Area, Nakhon Si Thammarat Province*, Technical Paper No.18/2006 (2006) 63.

[189] Thailand has totally 23 coastal provinces.

Kirikhan,[192] Rayong,[193] Narathiwat,[194] Pattani,[195] Satun,[196] and Nakhon Si Thammarat[197] Provinces. Particularly Pattani Province, push netters are prohibited to operate in the areas up to 12 nautical miles from the coast line.[198] For other coastal provinces, this new regulation has not yet been imposed due to the unsettled controversies among stakeholders.

In an effort to expand restricted fishing areas nationwide, the Department of Fisheries has proposed the provisions under the new *Fisheries Act*, concerning fishing zone establishment. Based on the provisions, three fishing zones are delimitated, including (i) coastal fisheries zone, which is the areas within three nautical miles from shore line or, if necessary in some areas, within 12 nautical miles from shore line; [199] (ii) offshore fisheries zone, which is the areas next to coastal fishing zone and no further than the areas of Thai waters;[200] and (iii) freshwater fisheries zone, which is fishing areas within Thai waters but not included in coastal and offshore fishing zones.[201] The Act also

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[190] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Trang Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 9 October B.E. 2550 (2007).

[191] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Krabi Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 9 October B.E. 2550 (2007).

[192] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Prachuab Kirikhan Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 9 October B.E. 2550 (2007).

[193] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Rayong Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 3 January B.E. 2551 (2008).

[194] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Narathiwat Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 3 January B.E. 2551 (2008).

[195] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Pattani Province in which fishing appliances, i.e., trawls used with motor vessels, are prohibited, given on 3 January B.E.2551 (2008).

[196] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Satun Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 29 January B.E. 2551 (2008).

[197] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Nakhon Si Thammarat Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 17 July B.E. 2552 (2009).

[198] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Pattani Province in which fishing appliances, i.e., push nets used with motor vessels, are prohibited, given on 14 July B.E. 2546 (2003).

[199] *The Fisheries Act B.E. 2558 (2015)* section 38.

[200] *The Fisheries Act B.E. 2558 (2015)* section 49.

[201] *The Fisheries Act B.E. 2558 (2015)* section 40.

empowers the Minister or the Provincial Committee in his jurisdiction with the approval of the Minister to issue regulations to govern the fisheries in each fishing zone.[202] The regulations include, for example, specifying types, sizes, numbers and components of fishing gears that are prohibited to operate[203] and identifying fishing practices that are forbidden to be conducted.[204]

In terms of fishing gear restrictions, a number of the regulations are currently imposed on marine capture fisheries. The notably regulations include a regulation to prohibit any fishing surrounding nets having mesh size smaller than 2.5 centimetres to operate at night time (between sun rise and sun set).[205] Subsequently, any fishing gear having mesh size smaller than 2.5 centimetres and employed with electricity generators are banned in Thai waters. But this regulation is not imposed on falling nets or lift nets employed with electricity generators to fish anchovies in the areas farer than 3,000 metres from shore lines.[206] However, anchovy falling nets or lift nets with electricity generators and surrounding nets with less than 0.6 centimetres of mesh size are prohibited.[207] Additionally, there are some regulations that prohibit certain fishing gears to operate in particular areas. These prohibited fishing gears are mainly trawls, push nets, and shellfish dredges employed with powered vessels. For example, these gears are prohibited in some areas of Prachuab Kirikhan[208] and Trad Provinces.[209] For push nets used with any powered vessels in particular, they are banned in all areas of Pattani Province.[210] Beam trawls are also banned in particular areas of Chonburi Province.[211]

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[202] *The Fisheries Act B.E. 2558 (2015)* section 6.

[203] *The Fisheries Act B.E. 2558 (2015)* section 6(1).

[204] *The Fisheries Act B.E. 2558 (2015)* section 6(2).

[205] Notification of the Ministry of Agriculture and Cooperatives Re: Prohibition of surrounding nets having meshes of smaller than 2.5 centimetres in width in fishing at night, given on 14 November B.E. 2534 (1991).

[206] Notification of the Ministry of Agriculture and Cooperatives Re: Setting mesh sizes of nets to be used in fishing with electricity generators (second edition), given on 6 October B.E. 2543 (2000).

[207] Notification of the Ministry of Agriculture and Cooperatives Re: Determining of mesh sizes of nets in fishing anchovies, given on 1 February B.E. 2543 (2000).

[208] Notification of Prachuab Kirikhan Province Re: Determining the area in which certain kinds of fishing appliances are prohibited in fishing in some localities of Prachuab Kirikhan Province, given on 19 October B.E. 2542 (1999). This regulation also prohibits purse seines used with powered vessels to operate in these areas (except anchovy purse seines operating in day time).

[209] Notification of Trad Province Re: Determining the area in which trawls, push nets and shellfish dredges are prohibited, in fishing at strait of Chang Island, Trad Province, B.E. 2543, given on 28 March B.E. 2543 (2000).

[210] Notification of the Ministry of Agriculture and Cooperatives Re: Prohibition of push nets used with motor vessel in fishing in the locality of Pattani Province, given on 26 February B.E. 2541 (1998).

All of these restrictions primarily aim to protect juveniles and young fish from being caught in coastal areas that may lead to fish extinction, as well as to preserve coastal fishing grounds for small-scale fishing gears as they cannot compete over fisheries resources with large-scale fishing gears. Thus, these regulations have not been issued to directly address overcapacity problem in Thai fisheries, but rather for fisheries resources conservation in coastal waters.

Further, the problem of overcapacity in Thai waters still exists not only because several fisheries restrictions are mainly designed for the purpose of marine resources conservation, but also there is no output controls in Thai fisheries. These gear and vessel restrictions alone make small effect on capital stuffing as fishers still have incentives to modify their fishing gears or vessels based on the loopholes of current regulations in order to increase or maintain their catch, such as increasing the horsepower of the vessel. Moreover, the inadequacy of the MCS system has magnified this problem as illegal fishing has been regularly found in Thai waters. Most of the cases are the violations of trawlers against the Thai fisheries laws, particularly the regulations governing the prohibited zone for trawlers.[212]

In order to strengthen the regulations imposed on fishing gears and vessels, the Master Plan provides the action plan of fishing gears development for the purpose of sustainable fisheries. The projects under this action plan include compiling and promoting the fishing gears and practices that support sustainable fisheries in Thai waters.[213] For this objective, set net has been recommended.[214] This recommendation has been provided based on the result of pilot project of set net implementation conducted by SEAFDEC/TD and the Department of Fisheries, which showed the success in terms of increased catch production and creating the collaboration among fishers to conserve marine resources.[215] Additionally, the Department of Fisheries has

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[211] Notification of Chonburi Province Re: Determining the area in which beam trawls are prohibited in some localities of Chonburi Province, given on 23 March B.E. 2542 (1999).

[212] Department of Fisheries, ผลคดีจับกุมผู้กระทำผิด พ.ร.บ. การประมง พ.ศ. *2490* ประจำเดือนพฤศจิกายน *2555 [Violations Against the Fisheries Act B.E. 2490 (1947) in November 2012]* (17 December 2012) <http://www.fisheries.go.th/secretary/pr_old/news_detail.php?news_id=399>.

[213] *The Master Plan*, strategy 3, measure 1, project 1-2.

[214] *The Master Plan*, strategy 3, measure 1, project 3.

[215] This pilot project was funded by Japanese Trust Fund Program. The objectives of the project are 'to reduce fishing pressure on coastal fishery resources through the introduction of set net fishing gear, to

promoted community-based fisheries management for set net fisheries in a number of fishing communities, such as fishing community in Bang Sapan Subdistrict of Prachuab Kirikhan Province.[216] Details of community-based fisheries management under this project will be discussed in the next chapter.

The Master Plan also supports the development of gear restrictions on trawlers, particularly mesh size control of trawl nets, which has never been enforced by Thai fisheries laws.[217] This project originally aims to decrease the proportion of juveniles in the catch of trawlers by enlarging the cod end mesh size of trawl nets (e.g., from 2.5 centimetres to 4.0 centimetres). The project has been carried out by using a participatory approach where stakeholders are greatly involved in conducting every step of the pilot projects (e.g., conduct experiments of using 4.0 centimetres of cod end mesh size on fishers' trawlers) in order to assure that the project results (and probably the mesh size restrictions later enforced) would be accepted by stakeholders, particularly trawl fishers. Although the main purpose of mesh size enlargement is to conserve fish stocks, it would also provide the benefit in terms of fishing effort reduction. Nonetheless, this project is still ongoing and therefore the outcome has not yet been sufficiently analysed.

Overall, fisheries management based on input controls generally relies on the assumption that technical interactions are inflexible and they not within the control of the fishers. If that is not the case, fishers may adapt to management regulations by modifying fishing gears or changing their fishing strategies that may result in the change in markets. Changing target stocks or stock components could affect the fishing mortality rates and restrict the intended conservation benefits of the management measure.[218] If the technical interactions are not flexible, then effort regulation affects all

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alleviate fishing competition in congested fishing ground by organizing collective fishing operation on the set net, and to develop common policy concept of fishery management for fishing gear occupying wide fishing ground such as the set net.' See, Pattaratjit Kaewnuratchadasorn, Narumo Thapthim and Phattareeya Suanrattanachai, 'The Implication of Set Net Fisheries to Coastal Fisheries Management - Introduction of Set-Net Fishing to Develop Sustainable Coastal Fisheries Management in Southeast Asia: Case study in Thailand, 2003-2005' (TD/RS/121, SEAFDEC, January 2008) 3.

[216] Prachuab Kirikhan Provincial Fishereis Office, โครงการ การจัดการโป๊ะเชือกโดยชุมชน [*Project: Community-based fishery management for set net]* <http://www.fisheries.go.th/fpo-prachuap/index.php?option=com_content&view=article&id=33&Itemid=163>.

[217] There are no particular restrictions on the mesh size of any trawl nets. The fishers, however, generally use the trawl net with 2.5 centimetres of cod end mesh size.

[218] Commission of the European Communities, 'Report of the Scientific, Technical and Economic Committee for Fisheries, Mixed Fisheries' (6-10 November 2006)

stocks in the fisheries without consideration of the individual stocks.[219] As a result, effort regulation can reduce fishing effort effectively. However, the most productive stocks might remain underexploited, so that the optimal utilisation of the biological productivity might not be achieved.[220]

Another concern that should be taken into consideration is that if only input regulations are implemented as the management measure, the fishing effort might be decreased greatly in the short term, CPUE might increase, and harvesting cost might also decrease. Consequently, the increase of profit and resource rent might be obtained. This, however, could create more incentives for investment in the fisheries sector.[221] There might also be the substitution of restricted input by unrestricted ones, such as the number of fishing days with the horsepower of the vessel, the amount of fishing gears, or the number of crews. In the long term, if input substitution is not protected effectively, input regulations may lead to capital stuffing, reduced profit and resource rent, increased fishing mortality, and a deteriorated resource.[222]

In short, it can be clearly seen that effort or input regulations alone are not sufficient to achieve sustainable and efficient controls of fishing capacity.[223] However, combining effective input and output regulations (e.g., effective buyback scheme and effective TACs scheme)[224] should be able to control fishing capacity at the optimal level for sustainable fisheries.

4.3.1.2 Output Regulations

Output regulations that directly control the amount of catch obtained from the fisheries are basically applied in order to give the stock resource a chance to reproduce or to protect the stock resource from declining. However, output restrictions imply the limits

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<http://stecf.jrc.ec.europa.eu/documents/43805/122924/06-11_SG-RST+06-04-05+Mixed+fisheries.pdf> 11.

[219] Symes, above n 72, 184.

[220] Ibid.

[221] Ibid 184-5.

[222] Ibid.

[223] OECD, *Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources* (OECD, 1997) 185.

[224] Greboval and Munro, above n 75, 23.

of fishing effort that may be used to harvest fish, and they, therefore, limit the utilisation of inputs. The limitations on outputs may control the excessive catch of the stock, or overfishing, but they may concurrently create excess capacity at current stock levels as well. This is due to the fact that open access motive still exists for any single vessel to increase its fishing effort as much as possible profits can be created (average income is more than the average cost).[225] Output regulations, which could be referred to as production measures,[226] can be used to set catch quotas either for an entire fishery such as TACs that are often adopted based on MSY,[227] or for particular vessels and the sum of these quotas is equivalent to TACs of the entire fishery.[228] However, the output control used to significantly address overcapacity is by setting vessel catch limits.

4.3.1.2.1 Vessel Catch Limits

Vessel catch limits control the landing catch of a vessel, either on a per-trip basis, or a per-time period basis, such as per day, week, or month.[229] The former does not limit the number of fishing trips, which a vessel can spend, whereas the latter does not limit the number of fishing time periods, which a vessel can spend.[230] These limitations aim to increase the fisheries resource. Thus, after implementing this vessel catch limits program, there may, or may not, be a great number of vessels getting out from the fishery during the initial stage.[231] Vessel catch limits are applied in some States, for example, in Belgium, the Flemish government have maximum catches per calendar day implemented in sole, plaice and cod fisheries. The quota allocation is divided by taking into consideration the engine power of the vessels.[232]

Theoretically, applying the vessel catch limits scheme, which partly addresses the property rights issue,[233] will decrease the race for fish and capital stuffing, and therefore

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[225] Pascoe et al, above n 7, 23.

[226] FAO, above n 3, 44.

[227] Colin R Townsend, Michael Begon and John L Harper, *Essentials of Ecology* (Blackwell, 2008).

[228] Committee to Review Individual Fishing Quotas National Research Council, above n 156, 119.

[229] Greboval and Munro, above n 75, 27.

[230] Ibid.

[231] Ibid.

[232] FAO, *Information on Fisheries Management in the Kingdom of Belgium* (January 2005) <http://www.fao.org/fi/oldsite/FCP/en/BEL/body.htm>.

[233] Ward et al, above n 5, 34.

overcapacity problem will be lessened.[234] This scheme is usually used to combine with other control measures, and its effectiveness in mitigating capacity will depend upon other measures combined with it. For example, if combined with effort quotas, vessel catch limits will have the same effect as individual harvest quotas (IQs) scheme. This combination, however, is less effective than true IQs scheme, especially the transferable IQs. Furthermore, when this scheme is combined with TACs, it creates a little effect on the alleviation of overcapitalisation, which is commonly associated with regulated open access.[235] Similar to other output controls, the success of vessel catch limits relies on the ability to monitor the total catch as the shortcoming of this scheme is that fishers could cheat by landing fish out of the ports and misreport to the authority. Therefore, in order to overcome this problem, vessel catch limits are suggested to be applied in community-based fisheries where landing places are restricted[236] and have reliable landing records. Alternatively, this scheme should be applied when the actual total catch can be measured by observers at sea or from verifiable logbook data.[237]

Apart from implementation at national level, vessel catch limits are also applied in the RFMO competent areas. For instance, the International Pacific Halibut Commission (IPHC) has imposed the regulation of fishing period limit, which refers to 'the maximum amount of halibut that may be kept and landed by a vessel during one fishing period', to commercial fishing for halibuts in their competent areas.[238] Additionally, vessel catch limit schemes have been used in recreational fishing. For instance, the IPHC has applied a daily bag limit, referring to 'the maximum number of halibut a person may take in any calendar day from Convention waters,' to sport fishing in the Convention area.[239] Australia has also widely imposed vessel catch limits, daily bag and boat limits in particular, to recreational fishing of many species. For example, the government of South Australia has imposed the regulation of bag and boat limits on species, such as abalone, Australian herring, blue swimming crab and mud cockle.[240]

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[234] Organisation for Economic Co-operation and Development, above n 73.

[235] Greboval and Munro, above n 75, 27.

[236] Ward and Metzner, above n 63, 76.

[237] Committee to Review Individual Fishing Quotas National Research Council, above n 156, 119-20.

[238] *Pacific Halibut Fishery Regulations 2012*, section 12.

[239] *Pacific Halibut Fishery Regulations 2012*, section 25.

[240] Government of South Australia, *Fishing Limits* (2005) <http://www.pir.sa.gov.au/fishing/fishing_limits>.

The results likely show the success, particularly on abalone, as its stock status suggests that it is sustainably fished.[241]

4.3.1.2.2 Vessel Catch Limits Scheme in Thailand's Context

The discussion in the previous sections show that traditional fisheries management of marine fisheries in Thailand has been based exclusively on the control of fishing effort or input controls, gear and vessel restrictions, in particular. This is mainly due to the multi-species nature of Thai fisheries and the large numbers of vessels dispersed along the coasts which make any attempts to implement catch controls as complementary measures very difficult and costly. Therefore, Thailand has implemented neither vessel catch limits nor TACs schemes in marine capture fisheries. The imposition of output controls on fishing capacity is unlikely to be a practical measure in the Thai fisheries context.

In sum, incentive blocking measures are basically designed to support the market adjustment of excess capacity.[242] But it is important to stress that these measures have only temporary impacts on limiting or reducing capacity as although these short run solutions mitigate capacity build-up by freezing or slowing capacity growth rate, they do not adjust the economic incentives of fishers.[243] This means the issue of capital stuffing can always arise, and thus overcapacity problem would still remain in the fisheries. To tackle this issue, incentives adjusting measures and other measures have been introduced as alternative tools to address overcapacity problem in fisheries. The incentive adjusting measures and supplementary management measures are discussed in greater detail in succeeding chapters.

[241] The Fisheries Division of Primary Industries and Regions South Australia, 'Ecological Assessment of the South Australian Abalone Fishery: Reassessment Report' (June 2003) <http://www.environment.gov.au/system/files/pages/a5b35bda-cd0f-45c2-acf1-1fafb5bed65c/files/application-2013.pdf> 18.

[242] Ward and Metzner, above n 63, 74.

[243] Ibid.

4.4 Conclusion

This chapter first described the measurement and assessment of overcapacity in fisheries, which can be determined according to the methods used. The quantitative measures determine overcapacity as either the difference or ratio of the potential level to the target level, and either on an input or output bases, according to a number of indicators. Qualitative indications, on the other hand, can be used to determine overcapacity in a fishery or fisheries, where required information may not be promptly available, particularly in open access or regulated open access fisheries. However, it is essential to use a combination of qualitative indicators, and not only one, in a careful manner and with the necessary technical expertise.

The second part of this chapter provided standard tools that can be implemented to control fishing capacity, focusing on incentive blocking measures. These measures are categorised into two main groups, namely, input and output regulations. Significant input regulations consist of limited licensing, individual effort quota, and gear and vessel restriction, whereas vessel catch limits scheme was discussed as output regulations. Thailand has implemented a number of input regulations but no output regulations due to constraints in terms of its tropical fisheries nature, which are multi-species and multi-gear type. Overall, it was concluded that implementing each of incentive blocking measures alone is not adequate to address overcapacity issue as it makes a minimal effect on capital stuffing, which is the core problem of regulated open access fisheries such as Thai fisheries. Therefore, alternative management measures, such as incentive adjusting measures, should be considered to have a more effective outcome in solving the problem of overcapacity.

CHAPTER 5 INCENTIVE ADJUSTING MEASURES FOR MANAGING FISHING CAPACITY AND IMPLEMENTATION BY THAILAND

5.1 Introduction

Apart from incentive blocking measures discussed in the previous chapter, there are also incentive adjusting measures used to manage fishing capacity worldwide. This chapter analyses a set of incentive adjusting measures, including individual harvest quotas, territorial use rights in fisheries, co-management and community-based fisheries management, taxes, and subsidies. The effect of each measure on capacity control is analysed. The implementation of a particular measure by Thailand is also examined.

5.2 Incentive Adjusting Measures

Incentive adjusting measures are basically designed to eliminate or mitigate the fishers' tendencies towards overexploitation and overcapitalization[1] by attempting to address property rights issues[2] and allowing the market to assist in reducing overcapacity.[3] It is simply put that incentive adjusting measures correct overcapacity by creating market incentives that decrease capacity levels in a fishery.[4] These measures are considered as long run solutions to address overcapacity problem.[5]

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[1] Dominique Greboval and Gordon Munro, 'Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper No. 386 (FAO, 1999) 206, 28.

[2] 'Rights' in a fishing context is defined as an interest that an individual or a group of entities can claim to harvest a stock of fish. This interest can be indicated in law (e.g., common, statute, or administrative law) or characterised in social and political structure, which does not have a formal form of law. See, Nina Mollett, Philip A Neher and Ragnar Arnason (eds), *Rights Based Fishing* (Kluwer Academic Publishers, 1989) 5. However, there is no definite reason to confirm that having property rights developed will automatically result in marine resource utilisation in a more sustainable way. See, Eleanor J Milner-Gulland and Ruth Mace, *Conservation of Biological Resources* (Blackwell Science, 1998) 159.

[3] John M Ward et al, *Measuring and Assessing Capacity in Fisheries: 1. Basic Concepts and Management Options* (FAO, 2004) 25.

[4] John M Ward and Rebecca Metzner, 'Fish Harvesting Capacity, Excess Capacity, and Overcapacity: A Synthesis of Measurement Studies and Management Strategies' (FAO, 2002) <ftp://ftp.fao.org/docrep/fao/005/y8169e/y8169e00.pdf> 76.

[5] Ibid 74.

Incentive adjusting measures can be categorized into two subgroups. The first subgroup is created to generate full, or partial, property rights over fishery resources for fishers,[6] so that they are willing to harvest the resources within appropriate conservation limits.[7] Consequently, overcapacity is expected to be removed from the fishery.[8] The measures falling into this subgroup include individual harvest quotas, territorial use rights in fisheries, co-management and community-based fisheries management. The second subgroup includes measures that adjust economic incentives in the fishery. The significant measures presented here are taxes, and subsidies.

5.2.1 Individual Harvest Quotas

Individual harvest quotas (IQs) are defined as quotas that provide an individual producer (an individual or a legal entity, such as a firm) the right to harvest a specified amount and species of aquatic resources in a particular place during a particular time period.[9] An IQ is usually presented as an individual portion of a total quota or TAC,[10] which is generally set by the resource management authorities. The IQ can be a fixed amount or a percentage of TAC.[11] Most of current IQ systems, however, are found as a form of percentage of TAC.[12] For example, IQs in New Zealand, who is the world leader in using IQs, have been dominated as percentages of the total allowable commercial catch (TACC).[13] In many cases, the quotas are allocated to fishers based on their historic fishing patterns. For instance, EU, under EU Common Fisheries Policy (CFP), allocates TACs to each Member State according to its historic fishing records.[14]

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[6] Greboval and Munro, above n 1, 28.

[7] Rebecca Metzner, *Fisheries and Aquaculture Topics. Regulating Fishing Capacity. Topics Fact Sheets.* (27 May 2005) FAO <http://www.fao.org/fishery/topic/14857/en>.

[8] Ward and Metzner, above n 4, 76-7.

[9] OECD, *Individual [Fishing] Quota* (6 March 2003) <http://stats.oecd.org/glossary/detail.asp?ID=1333>.

[10] Ibid.

[11] Greboval and Munro, above n 1, 22.

[12] Organisation for Economic Co-operation and Development, 'Synthesis Report for the Study on the Economic Aspects of the Management of Marine Living Resources' (AGR/FI (96) 12, OECD, 1996).

[13] Lock Kelly and Leslie Stefan, 'New Zealand's Quota Management System: A History of the First 20 Years' (Motu Economic and Public Policy Research, April 2007) <http://motu-www.motu.org.nz/wpapers/07_02.pdf> 17.

[14] John Andersen, 'Right Based Management in the United Kingdom - the Shetland Experience' in Colin Ralph Townsend, Ross Shotton and Hirotsugu Uchida (eds), *Case Studies in Fisheries Self-governance* (2008) 54.

The advantages of IQ scheme are that operators with IQs have the flexibility to increase their profit by finding the most efficient way to harvest fish with less cost and gain highest revenues, such as spreading their effort optimally across the entire season and selling their products when prices in markets are higher.[15]

The IQs can be considered as property. In case they can be transferred (ITQs), then they may be purchased, sold, leased and exchanged as same as other types of property.[16] ITQs are also known as individual fishing quotas (IFQs) that are allowed to be transferred.[17] When quotas can be transferred with no limits, individual fishers or a company can adjust their fishing operations by purchasing or selling quota. Thus, the price mechanism that controls the quota market will cause quota redistribution, and therefore quotas would finally be consolidated to the most efficient operators.[18] ITQs can fundamentally change incentives in the fishery because their value depends upon the status of fish stock, fishers, therefore, are more motivated to protect the stock, to self-monitor, and to collaborate.[19] Hence, at the same time ITQs are capable to address both biological and economic goals.[20] In many fisheries where ITQs have been implemented, remarkable decline in capacity has been found over time,[21] thus they are able to address the issue of overfishing and overcapacity.[22] During year 1950 to 2003, there were 148 out of 11,135 commercial fisheries that have been managed under ITQs scheme,[23] and those having well designed catch share system showed the results in

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[15] Ikerne del Valle et al, 'Right-Based Fisheries Management' in Lorenzo Motos and Douglas Clyde Wilson (eds), *The Knowledge Base for Fisheries Management* (ELSEVIER, 2006) 55, 56-7.

[16] Greboval and Munro, above n 1, 32.

[17] South Atlantic Fishery Management Council, *IFQs/ITQs An Overview* <http://www.safmc.net/Portals/6/SocioEcon/IFQs/IFQfactsheet_eng.pdf>.

[18] del Valle et al, above n 15, 57.

[19] Gary D Libecap, 'Allocation Issues in Rights-Based Management of Fisheries: Lessons from Other Resources' in R Quentin Grafton et al (eds), *Marine Fisheries Conservation and Management* (Oxford University Press, 2010) 572, 572-3. In many ITQ systems, fishery industries have supported conservation activities and research programs. See, Colin W Clark, 'Fisheries Bioeconomics: Why is It so Widely Misunderstood?' (2006) 48(2) *Population Ecology* 95, 97.

[20] del Valle et al, above n 15, 55.

[21] Ward and Metzner, above n 4, 77.

[22] Colin W Clark, *The Worldwide Crisis in Fisheries Economic Models and Human Behavior* (Cambridge University Press, 2006) 4.

[23] Christopher Costello, Steven D Gaines and John Lynham, *Number of Fisheries Managed with Individual Transferable Quotas (ITQs)* <http://fiesta.bren.ucsb.edu/~costello/research/CatchShares/ITQ_Managed_Fisheries_List_Map.pdf>.

preventing fishery collapse.[24] Currently, there are at least 18 States[25] worldwide implementing ITQ systems to manage their fish stocks, accounting 249 species in total.[26]

In sum, the core characteristics of ITQs include: (i) **exclusivity**: quota owners are given the property rights to freely harvest resources; (ii) **durability**: quotas are allocated for the owners as long as they want or in perpetuity; (iii) **security or quality of title**: quota owners have capability to maintain their property right; and (iv) **transferability**: quota owners can freely transfer their property right to others, meaning quotas can be bought and sold.[27] Based on these characteristics, which are the essential components of managing fishing capacity, FAO has therefore acknowledged this rights-based fisheries management scheme as the best approach for fishing capacity management.[28] As a result, ITQs have been strongly suggested as a technical tool for fishing capacity management in many significant fisheries.[29]

With an ITQ scheme, a buyback program may become a useful supplement instrument. When applying the buyback scheme with limited entry scheme, it may not achieve the successful outcome because of two factors. Firstly, as the economic incentives in fishery are still the same, fishing capacity tends to return to the fishery after capacity elimination through the buyback program.[30] Secondly, as the buyback program proceeds, the anticipated rent from the fishery will consequently increase the value of

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[24] Christopher Costello, Steven D Gaines and John Lynham, 'Can Catch Shares Prevent Fisheries Collapse?' (2008) 321(5896) *Science (New York, N.Y.)* 1678, 1680.

[25] These 18 States include Argentina, Australia, Canada, Chile, Denmark, Estonia, Falkland Islands, Greenland, Iceland, Italy, Morocco, Mozambique, Namibia, the Netherlands, New Zealand, Portugal, South Africa, and the United States. See, Cindy Chu, 'Thirty Years Later: the Global Growth of ITQs and their Influence on Stock Status in Marine Fisheries' (2009) 10(2) *Fish and Fisheries* 217, 220.

[26] The species are, for examples, herring, plaice, sole, Greenland halibut, whiting, rock lobster, spiny lobster, sablefish, Canadian cod, Canadian haddock, Southern bluefin tuna, orange roughy, and Pollock. See, ibid, 221.

[27] Ragnar Arnason, 'Property Rights in Fisheries: Iceland's Experience with ITQs' (2005) 15(3) *Reviews in Fish Biology and Fisheries* 243, 246-7.

[28] FAO APFIC, 'APFIC Regional Consultative Workshop Managing Fishing Capacity and IUU Fishing in the Asian Region, Phuket, Thailand, 13-15 June 2007' (RAP Publication2007/18, FAO/RAP, 2007) <ftp://ftp.fao.org/docrep/fao/010/ah999e/ah999e00.pdf> 14.

[29] Steffen Hentrich and Markus Salomon, 'Flexible Management of Fishing Rights and a Sustainable Fisheries Industry in Europe' (2006) 30(6) *Marine Policy* 712, 712.

[30] Greboval and Munro, above n 1, 32.

the vessel licenses. Subsequently, the buyback program is very costly for authorities.[31] But under the ITQ scheme, the incentives have been corrected. Besides, the future resources rent from expected capitals is comprehended in the value of ITQs, rather than in the value of the vessel licences. Thus, buyback programs can stimulate and facilitate the transfer of ITQs from high to low cost producers, as well as to remove vessels from the fishery.[32]

ITQ systems have been carried out with favourable outcomes in many States including New Zealand, Australia, Iceland, the United States and Canada.[33] However, the quota management system (QMS), which is the world largest ITQ based system[34] firstly implemented in 1986 by New Zealand, is considered as one of the best examples. QMS has been used to manage all significant commercial species in New Zealand with successful results.[35] The key factor of this achievement is that the government is capable to 'determine the spatial scale that species are managed at (and how adjustments are made to these areas), the process for setting sustainable harvest levels, the allocation of catch between the different fishing sectors and the definition of quota.'[36] In terms of quota management areas (QMAs), which refer to 'geographic areas within which fish stocks are managed in the EEZ[37] of New Zealand, they are determined according to the biological information of stock distributions of each species. Managing species stocks in QMAs will therefore allow the authorities to put controls to sustain these populations.[38] QMAs were originally divided in accordance with the ten fisheries

[31] Ibid.

[32] Ibid.

[33] Liz Neeley, *New Study Offers Solution to Global Fisheries Collapse: 'Catch Shares' End Race-to-fish, Rescue Failing Fisheries, Protect the Ocean* <http://www.eurekalert.org/pub_releases/2008-09/s-nso091208.php>; Chu, above n 25, 219-20.

[34] Richard G Newell, James N Sanchirico and Suzi Kerr, 'Fishing Quota Markets' (2005) 49(3) *Journal of Environmental Economics and Management* 437, 459.

[35] Kelly and Stefan, above n 13, 1. Currently, there are 97 species (or species groupings) managed by QMS. These species are divided into 629 separate stocks. Each stock is managed independently to assure the fishery sustainability. See, Ministry for Primary Industries, *Commercial Fishing* (8 October 2013) <http://www.fish.govt.nz/en-nz/Commercial/default.htm?wbc_purpose=basic&WBCMODE=presentationunpublished%23MainContentAnchor>.

[36] Kelly and Stefan, above n 13, 3.

[37] Ministry of Fisheries, *Report from the Fishery Assessment Plenary, May 2007: Stock Assessments and Yield Estimates* (Ministry of Fisheries, 2007) 12.

[38] Ministry for Primary Industries, *Quota Management System: New Zealand's Quota Management System (QMS)* (4 June 2014) <http://fs.fish.govt.nz/Page.aspx?pk=81&tk=248>.

management areas (FMAs) within the EEZ of New Zealand[39] and the boundaries of QMAs for each species could not be changed.[40] Later, due to the purpose to ensure the perpetual sustainability of stocks, boundaries of QMAs can be altered by government if the change is necessary according to a number of factors, e.g., 'the biological characteristics of a particular stock that would be impacted by the recommendation',[41] and 'non-commercial fishing activities in the impacted area'.[42] However, the government needs to consult with stakeholders involving in the relevant QMA before any changes can be done.[43]

In terms of species managed under the QMS,[44] although most species are managed independently, some groups of species (i.e., similar species that are difficult for fishers to identify, and species that are often caught together) are considered and managed as they are a single species. Thus, a group of stock population can include only a single or group of species within the designated area of the QMS. For example, based on their similarity of two species of arrow squid (i.e., *Nototodarus sloanii* and *N. gouldi*), they are defined as a single species group, whereas the eight species of flatfish[45] are managed together due to the easiness of management.[46] For sustainable harvest levels of each species, government, by the Minister of the Ministry for Primary Industries (MPI),[47] is responsible to set the harvest levels or TACs that ensure to maintain fish stocks at or

[39] Kelly and Stefan, above n 13, 3.

[40] Ibid 5.

[41] *Fisheries Act 1996* Amendment Act 1999 section 25(3)(a)(ii).

[42] *Fisheries Act 1996* Amendment Act 1999 section 25(3)(a)(i).

[43] *Fisheries Act 1996* Amendment Act 1999 section 25(3)(b). It provides that '(b) consult the persons and organisations considered by the Minister to be representative of those classes of persons having an interest in the relevant quota management area, including Maori, recreational, commercial, and environmental interests;'

[44] New Zealand currently has 100 species (or species groupings) subject to the QMS. See, Ministry for Primary Industries, above n 38.

[45] They include the yellow-belly flounder (*Rhombosolea leporine*); sand flounder (*Rhombosolea plebeian*); black flounder (*Rhombosolea retiaria*); greenback flounder (*Rhombosolea tapirina*); lemon sole (*Pelotretis flavilatus*); New Zealand sole (*Peltorhamphus novaezeelandiae*); brill (*Colistium guntheri*); and turbot (*Colistium nudipinnis*). See, Ministry for Primary Industries, *Fisheries Assessment Plenary, May 2013: Stock Assessments and Yield Estimates, Volume 1: Introductory Sections to Jack Mackerel* (Fisheries Science Group, Ministry for Primary Industries, 2003) 247.

[46] Kelly and Stefan, above n 13, 6.

[47] The Ministry of Agriculture and Forestry and the Ministry of Fisheries were combined to form a single Ministry on 1 July 2011. On 30 April 2012, this new ministry was named as the Ministry for Primary Industries. See, Ministry for Primary Industries, *About MPI* (14 November 2012) <http://www.mpi.govt.nz/about-mpi>.

over a level producing the MSY,[48] or keep the biomass[49] at the level, which can support the harvest of MSY (BMSY).[50] Nonetheless, due to difficulties in determining the actual value of BMSY or MSY with limited information about fish population dynamics of particular species,[51] the proxy measures for MSY could be statistic measure (maximum constant yield, MCY) and a dynamic measure (current annual yield, CAY).[52] The estimates of MCY and CAY of each species, where it is possible, are reported every year.[53] These estimates, together with other relevant information, and a risk assessment, will be used by the government to determine the TAC in such particular year. The TAC will consider all amount of harvest from commercial, customary and recreational (or sport) fishing. However, the guideline provided in the Plenary Report is not necessary to be taken. Thus, for some species, it takes many years before the recommended TACs are accepted by stakeholders.[54]

In terms of quota allocation to fishers, New Zealand government used a consultation mechanism before concluding the criteria for allocation in the law.[55] The criteria used to allocate the quotas were different between inshore quotas and deepwater quotas due to more complexity and greater catch levels and fishing capacity needed to be reduced of

[48] *Fisheries Act 1996* section 13(2)(a).

[49] The biomass in fisheries context means 'the total weight of a stock or biological unit of fish or a defined fraction of it.' See, Ministry of Fisheries, *A Brief Explanation of Biomass and Maximum Sustainable Yield (MSY)* (July 2006) <http://www.option4.co.nz/FAQs/documents/AnexplanationofbiomassandMSY.pdf>.

[50] Kelly and Stefan, above n 13, 7.

[51] It is because there are several factors contributing to the systematic analysis of species' MSY. They include 'how fast they grow, when and how they reproduce and the pattern of harvesting in the fishery.' Furthermore, the MSY is typically variable over time due to productivity and environmental factors changed. See, Ministry of Fisheries, above n 49.

[52] MCY is 'a constant catch level that is estimated to be sustainable, with and acceptable level of risk, at all probable future levels of biomass.' As MCY is a constant figure, it must be specified adequately low to make certain that the viability of the stock is not affected, especially when the abundance of stock is low. CAY is yearly determined by incorporating fluctuations of factors, such as interspecies interactions, changes of environment, and human fishing pressure. Thus, CAY will give a time varying estimate of the MSY that still remains a fixed proportion of the fishing population. See, Kelly and Stefan, above n 13, 7.

[53] Ministry-led working groups convene to assess fish stocks, and technical information obtained for particular fishery is summarized in a report of working group and published yearly in the Fishery Assessment Plenary. See, Ministry for Primary Industries, *Departmental Output Expense - Fisheries Information* (16 November 2007) <http://www.fish.govt.nz/en-nz/Publications/Annual+Reports/Annual+Report+2007/Performance/Departmental+Output+Expense+-+Fisheries+Information.htm>.

[54] Kelly and Stefan, above n 13, 8.

[55] Ibid 11.

inshore fisheries.[56] Deepwater quotas have been allocated to companies that are capable to access the fishery and process their catch.[57] For inshore quota allocation, it was determined by considering the commitment of the fishers to fishery industry or a vessel's catch history.[58] Thus, those who were not qualified to be commercial fishers were automatically removed from fisheries as they could not receive the fishing permits. Although this arrangement resulted in fishing capacity reduction of inshore fisheries, it also created socio-economic problems for removed part-time fishers which majority was Maori[59] living in rural areas where commercial fishing, based on its definition, was not easy to conduct. Nonetheless, this inequity issue was later settled by the two legislations, i.e., the Maori Fisheries Act 1989 and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. At present anybody who wants to fish for a purpose of trading is required to obtain a commercial fishing permit, which is granted for a period of between one and five years. All permits are entitled to catch for most species. However, in order to conduct commercial fishing permit holders are required to comply with a number of regulations, such as fishing from a registered fishing; keeping records of catch, effort and landings; reporting their effort and landings to the Ministry regularly; and not discarding their fish (with limited exceptions).[60]

Currently the New Zealand government also identifies the sufficient allowance catch from each stock for recreational and customary uses, as well as all other sources of fishing.[61] The rest of that stock will be available for commercial fishing as the TACC of particular fishing year.[62] The TACC has to be set at the beginning of fishing year for

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[56] R Connor, 'Initial Allocation of Individual Transferable Quota in New Zealand Fisheries' in Ross Shotton (ed), *Case Studies on the Allocation of Transferable Quota Rights in Fisheries* (FAO, 2001) vol FAO Fisheries Technical Paper 411, 373.

[57] Kelly and Stefan, above n 13, 12.

[58] According to Section 64 of *the Fisheries Act 1983* of New Zealand, commercial fishers needed to earn at least NZD10,000 from fishing or to gain more than 80 per cent of their revenue from fishing or to earn a vital part of subsistence income (i.e., NZD6,400) from fishing. See, Randall Bess, 'Expanding New Zealand's Quota Management System' (2005) 29(4) *Marine Policy* 339, 341. However, these requirements were later repealed by *the Fisheries Act 1996* that focused on sustainability and utilisation rather than the commitment and dependence factors. See, Kelly and Stefan, above n 13, 19.

[59] Maori are New Zealand's indigenous people.

[60] Ministry for Primary Industries, *Quota Management System: Permitting of Commercial Fishers* (23 July 2009) <http://fs.fish.govt.nz/Page.aspx?pk=81&tk=250>.

[61] Ministry for Primary Industries, *Quota Management System: Determining the Total Allowable Catch (TAC)* (1 September 2009) <http://fs.fish.govt.nz/Page.aspx?pk=81&tk=400>.

[62] The fishing year is mostly from 1 October to 30 September. For rock lobster and southern blue whiting, and some other minor stocks, however, their fishing year is from 1 April to 30 March. Besides,

that particular year and subsequent fishing years until it needs to be changed.[63] For the quota of each stock, it represents as shares, which can be purchased and sold. The total number of quota shares for all fish stocks is always 100 million shares, and the value of one share equals one hundred-millionth of the TACC.[64] There are aggregation limits on quota shares that can be held by an individual.[65] When the TACC is already set, the kilogram equivalent of particualr quota share is analysed and transferred to the quota owner on the first fishing day of each year as annual catch entitlements (ACE). ACE, therefore, represents the quantity of fish (tonnes), which the quota owner can fish within the fishing year.[66] There are no restrictions on the aggregation limits of ACE, and ACE is also freely tradable.[67] The implementation of QMS by New Zealand is then capable to address fishing capacity both in output (e.g., TACC) and input (e.g., fishing permits, fishing vessels) aspects. The study on fish quota markets in New Zealand also suggests that these markets are operating well.[68] Thus, the QMS can be considered as an effective ITQ tool to manage not only fishing capacity but also fisheries as a whole.

In addition to New Zealand, Iceland also has the success in implementing ITQs. Iceland has used ITQs as the fundamental measure to manage their fisheries, particularly on fish stocks harvested by commercial fisheries. Licensed fishing vessels are allocated a fixed quota share of fish stocks subject to TAC, which is determined by the Ministry of Fisheries and in line with the suggestion from the Marine Research Institute (MRI).[69] The quotas were primary allocated to fishing vessels based on their catch history before ITQs introduced. Fishing vessels may hold permanent quota shares in the TAC for any species. Currently 24 species, accounting 95 per cent of total catch and more than 97 per

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the fishing year for Lake Ellesmere eels is from 1 February to 31 January. See, Ministry for Primary Industries, above n 38.

[63] Ministry for Primary Industries, above n 61.

[64] The holdings of quota shares are 'guaranteed by the Crown and are able to have mortgaged and other securities registered against them.' See, Ministry for Primary Industries, *Quota Management System: Quota* (1 September 2009) <http://fs.fish.govt.nz/Page.aspx?pk=81&tk=423>.

[65] For example, any person cannot have more than 10 per cent of quota shares of spiny rock lobster for any QMA. See, OECD, 'Country Note on National Fisheries Management Systems-New Zealand' (11 February 2005) <http://www.oecd.org/newzealand/34430857.pdf>.

[66] Kelly and Stefan, above n 13, 18. Aggregating limits forbid any person from holding more than a specified amount of quota shares but they do not apply to ACE. See, Ministry for Primary Industries, above n 64.

[67] OECD, above n 65.

[68] Newell, Sanchirico and Kerr, above n 34, 437.

[69] OECD, 'Country Note on National Fisheries Management Systems-Iceland' (11 February 2005) <http://www.oecd.org/greengrowth/fisheries/34429527.pdf> 14.

cent of total value from EEZ fisheries, have been managed by TAC and ITQs.[70] These species are, for instance, cod, Greenland halibut, haddock, herring, redfish, blue whiting, shrimp, scallops, and lobster. However, apart from ITQs, Iceland has additionally used other controls on fishing capacity, such as mesh size and gear restrictions, closure of fishing areas.[71]

For other States, such as the United States, they have implemented ITQ or IFQ program on only some fisheries stocks. In 1995, the United States have implemented IFQ program on the federal fixed gear commercial halibut and sablefish fisheries in Alaska, aiming to limit fishery access, address overcapacity and conservation and management issues because of open access fisheries.[72] This program has also explicitly addressed the unintended socioeconomic impacts on small fisheries communities by linking quotas to vessel size classes.[73] The favourable result of this program has been achieved.[74]

Although ITQs have been strongly recommended because they can reduce the race for the fish and the capital stuffing,[75] a number of difficulties are also found.[76] For example, ITQs may have limited applicability, particularly in tropical inshore fisheries where have multi-species but lack precise data for analysis.[77] It is due to the fact that to effectively determine TACs or quotas in multi-species fisheries, a set of reliable data of individual species, especially target species, is required. Furthermore, it might not be easy to determine quotas for many species that are usually caught at the same time since compliance and enforcement practices by official authorities corresponded with the operational practices of fishing vessels must be also considered.[78] For instance, beam

[70] Ibid 15.

[71] Ibid 14.

[72] Courtney Carothers, Daniel K Lew and Jennifer Sepez, 'Fishing Rights and Small Communities: Alaska Halibut IFQ Transfer Patterns' (2010) 53(9) *Ocean & Coastal Management* 518, 518.

[73] Ibid.

[74] FAO, 'Report of the National Seminar on the Reduction and Management of Commercial Fishing Capacity in Thailand. Cha-Am, Thailand, 11-14 May 2004.' (FIP/FCR13, FAO, 2005) <http://www.fao.org/docrep/008/j6419e/j6419e00.htm> 54.

[75] Greboval and Munro, above n 1, 32; Christopher Costello, Steven D Gaines and John Lynham, 'New Study Offers Solution To Global Fisheries Collapse' (2008) 49(11) *Sea Technology* 62, 62; Gary R Morgan, *Individual Quota Management in Fisheries - Methodologies for Determining Catch Quotas and Initial Quota Allocation* (Rome, 1997) iv.

[76] Clark, above n 22, 23.

[77] Greboval and Munro, above n 1, 33.

[78] Morgan, above n 75, 11.

trawl fisheries in Netherland that generally catch a combination of three main species, i.e., cod, sole and plaice, had been granted individual quotas of each particular species. It caused difficulties in practice because beam trawl fishers could not catch for only one species that they had quotas. Hence, they tended to either discard non-quota species or misreported their catch.[79] The strict enforcement by having on board fisheries inspectors was therefore put in place to address this issue. But, due to the inadequacy of the inspectors, the problem in enforcement was remained. If on-board inspector is all times available to monitor the catch and discards (e.g., mortality of marketable fish), this problem would be potentially lessened. For instance, after the implementation of full on-board observer coverage in the British Columbia groundfish fishery, the discards from this fishery (both marketable discards and total discards) reduced for most species.[80] Nonetheless, it is also significant to note that in many cases the well-designed ITQ system fails to give fishers incentives to protect marine habitat due to the fishing gears allowed,[81] for example, to protect the damage of sea bottom floor and ecosystem from trawlers.

Additionally, determination TACs for the ITQ system might need to consider economic efficiency of the fishery, requiring information not only on the biological status of fish stock but also on the fish price, the fishing operation cost, and the levels of discards.[82] The ITQ system may not provide favourable outcomes otherwise. For instance, the south east trawl fishery of Australia, which is a multi-species and multi-gear fishery, has been managed with a combination of ITQs and input controls (i.e., fishing gear and area restrictions, limited fishing licenses) but some quota species (e.g., orange roughy) [83] are currently overfished and real net returns in the fishery are low. To address this issue Australian government conducted the study suggesting that the TACs for key species should be determined by using economic efficiency criteria, and thus an integrated bio-economic model that incorporates both the biological information of the stock and

[79] Ibid.

[80] Trevor A Branch, Kate Rutherford and Ray Hilborn, 'Replacing Trip Limits with Individual Transferable Quotas: Implications for Discarding' (2006) 30(3) *Marine Policy* 281, 291.

[81] James E Wilen, Jose Cancino and Hirotsugu Uchida, 'The Economics of Territorial Use Rights Fisheries, or TURFs' (2012) 6(2) *REVIEW OF ENVIRONMENTAL ECONOMICS AND POLICY* 237, 244.

[82] Lisa Elliston et al, *Economic Efficiency in the South East Trawl Fishery* (2004) 2.

[83] Ibid 1.

economic information (i.e., costs and revenues of fishing operation) would help to set such TACs that provide favourable outcomes for both biological and economic goals.[84]

Within a TAC regulation system fishers have vast incentives to misreport in cases of constraining catch quotas and bycatch. Once the race for fish is finished, fishers may try to maximise the net value from their quota by keeping the best quality of fish and discarding the lesser quality ones.[85] This possibly distorts the information of inputs used for the biological advice. Such problem is aggravated in the valuable fisheries or in fisheries with a high CPUE that reliable information is most needed in the stock assessments.[86] Discarded bycatch (e.g., non-target species) can also result in overfishing of these populations. To address this issue, ITQ-based fisheries generally use on-board observers, whom are usually paid by the vessel owners, in order to ensure the accurate reporting of total catch and discards.[87] This demonstrates that although ITQ systems have been considered as the best approach to manage fishing capacity, the strict monitoring and enforcement are essential needed for the effective implication of this scheme.

The equity issue in society cannot be avoided to consider under ITQ implementation. As a well-designed and well-operated ITQ system can make profitable fisheries in a long run, the individual quotas might have high values. Therefore, this could lead to a question concerning the fairness among fishers since the government creates a system that provides wealth-creating chances to a chosen group of people.[88] Additionally, due to the high cost of buying quota, it is unlikely for young people to afford.[89] The similar issue could also happen to small-scale fishers who may not be able to pay for quota fees and then would have to leave the fishery. Furthermore, when the initial quota allocation was depended on catch records, it was provided to the vessel owner rather than the

[84] Ibid 2.

[85] del Valle et al, above n 15, 57; Clark, above n 22, 23.

[86] David Symes, 'Institutional Change and the Reform of Fisheries Management: Some Outstanding Questions' in David Symes (ed), *Alternative Management Systems for Fisheries* (Fishing News Books, 1999) 242, 183; Clark, above n 22, 23.

[87] Clark, above n 22, 23.

[88] Ibid.

[89] Ibid 24.

crews. This can also be biased against part-time fishers.[90] Hence, unless this inequity issue has been properly addressed, it can be an obstacle in implementation of ITQ scheme.[91] However, it is important to note also that even though some ITQ programs are designed to mitigate an inequity issue by distributing fishing quotas to all levels of fisheries (e.g., small-scale fisheries), unintended results could be still obtained. For instance, small indigenous fishery communities in Alaska have disproportionately lost fishing rights on halibut and sablefish fisheries as they are more likely to sell than buy quotas.[92]

In many cases the initial quotas have been purchased by fishers, who are not actually active in fishing. Then, the quotas might be leased back to other fishers by auction. It means almost entire economic rents accrue to the new quotas owners or to the original owners who got a quick profit by selling off their quotas.[93] Consequently, only minimal or zero rents go to the active fishers. This kind of arrangements removes the incentives in conservation from the fishers as they gain a little from conserving the resources.[94] Thus, the advantages of ITQ scheme are weakened or gone. In order to prevent the concentration of quota ownership, some ITQ systems require quota owners to be active fishers.[95] In this case, the least efficient fishers, gaining too low income from catching their quotas, may also decide to sell their quotas and leave fishery industry.[96] This will result in capacity reduction. Nonetheless, the restriction on quota owners that must be active in fishing could be difficult to enforce.

Apart from the difficulties aforesaid, States also need to take into account traditional rights (e.g., indigenous rights), if they exist, before implementing ITQ systems. It is important to make sure that such rights are explicitly considered, otherwise the conflicts between quota holders and local people, who have fished traditionally for a long time,

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[90] For example, ITQ system on orange roughy in New Zealand. See, Milner-Gulland and Mace, above n 2, 149-50.

[91] The US Congress outlawed ITQs in American fisheries for many years. It is basically because of the equity issue. See, Clark, above n 22, 23.

[92] Carothers, Lew and Sepez, above n 73, 518.

[93] Clark, above n 22, 23.

[94] Ibid 24.

[95] Ibid.

[96] Tsjalle van der Burg, 'Neo-classical Economics, Institutional Economics and Improved Fisheries Management' (2000) 24(1) *Marine Policy* 45, 46.

could be arisen.[97] For example, New Zealand government assumed that the establishment of the QMS would put no impact on Maori fishing rights that have been provided under the Treaty of Waitangi. But the claims and reports made by the Waitangi Tribunal subsequently disputed this QMS arrangement, which resulted in a long process of issue settlement between Maori and the Crown.[98]

Taking all difficulties into consideration, it is unsurprising that although ITQ scheme has proved to effectively address overcapacity problem in many fisheries, it has not yet been universally accepted. Furthermore, there has been controversy about its effectiveness on resources conservation as some fish stocks continued to decline after the implementation of ITQs.[99] This negative effect could happen due to a number of factors both external factors, such as too high TACs, lack of monitoring and enforcement, and intra-specific factors, such as naturally mortality of the stock.[100]

To implement ITQs successfully, it may depend on specific cultural and socio-economic conditions.[101] Furthermore, alternative controls on fishing capacity, such as gear and mesh size restrictions, closed fishing areas, may be needed to combine with ITQs. Additionally, some forms of licensing program (e.g., licensing to fish)[102] would be necessary to implement in concurrence with ITQs. Fishing capacity on non-quota species should be simultaneously managed as well.[103]

In terms of highly migratory species, currently RFMOs have attempted to implement IQs to manage highly migratory fish stocks in their competent areas. For example, the

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[97] Kelly and Stefan, above n 13, 26.

[98] Ibid.

[99] The declines of average biomass of six stocks (i.e., Greenland halibut, whiting, ocean quahog, Southern bluefin tuna, orange roughy, and Icelandic haddock), which have been managed under ITQ scheme have been determined. See, Chu, above n 25, 221.

[100] For example, although there is no sign of overfishing, ocean quahogs, which are among the longest lived (at least 200 years), slowest growing marine organisms in the world still have declining biomass. See, Larry Jacobson and James Weinberg, *Ocean Quahog* (December 2006) <http://www.nefsc.noaa.gov/sos/spsyn/iv/quahog/>.

[101] Anja von Moltke (ed), *Fisheries Subsidies, Sustainable Development, and the WTO* (Earthscan, 2010) 28.

[102] Ralph E Townsend, James McColl and Michael D Young, 'Design Principles for Individual Transferable Quotas' (2006) 30(2) *Marine Policy* 131, 134.

[103] Sean Pascoe and Tony Gibson, 'Do Boat Licences Have a Role in Fisheries Managed through Individual Quotas? Experience in Australian Fisheries' (2009) 33(2) *Marine Policy* 297.

Commission for the Conservation of Southern Bluefin Tuna (CCSBT)[104] have managed the stock of Southern Bluefin Tuna in their mandated area by using the TAC. The CCSBT has allocated TAC to Members[105] and Cooperating Non-Members[106] based on the Management Procedure (MP).[107] The TAC for 2014 was 12,449 tonnes, whereas the TAC for each year of 2015-2017 will be 14,647 tonnes.[108]

5.2.2 Individual Harvest Quotas Scheme in Thailand's Context

Similar to many States having tropical multi-species fisheries, Thailand has not implemented any IQs systems on marine fisheries. The obstacles are not only the difficulties in obtaining a great amount of information concerning fishery biology of each target species, which is essential in determination the TAC of each stock, but also the constraint of limited ability in enforcement of authorities, taking into account a huge number of fishing landing sites largely scattering in Thailand. In terms of setting the TACs in particular, although many ITQs programs are currently used to manage multi-species fisheries as mentioned earlier, the level of complexity of such fisheries varies the effectiveness of such TACs. For example, in a large marine ecosystem with a big number of species and stocks involved, there is higher possibility that the determined TACs may not correspond with the actual state of concerned stocks, and/or harvesting some non-quota species may affect the catch amount of quota species. Furthermore, another complexity could be a wide range of the difference of specie lift history (e.g., mature age of each species), which affects the pattern of fishing mortality of the species.[109] Thus, to implement IQ programs on multi-species fisheries, the appropriate balance between the risk of overexploitation (of each species), the economic benefits, and administrative costs must be critically considered.[110] Given these mentioned factors,

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[104] CCSBT, *Total Allowable Catch* (2015) <http://www.ccsbt.org/site/total_allowable_catch.php>.

[105] Members include Australia, the Fishing Entity of Taiwan, Indonesia, Japan, Republic of Korea and New Zealand. See, CCSBT, *The Conservation of Southern Bluefin Tuna (CCSBT)* (2015) <http://www.ccsbt.org/site/index.php>.

[106] Cooperating Non-Members consist of the Philippines, South Africa and the European Union. See, ibid.

[107] Resolution on the Allocation of the Global Total Allowable Catch (1), adopted at the Eighteenth Annual Meeting on 10-13 October 2011.

[108] CCSBT, above n 104.

[109] James N Sanchirico et al, 'Catch-quota Balancing in Multispecies Individual Fishing Quotas' (2006) 30(6) *Marine Policy* 767, 783.

[110] Ibid 784.

implementing IQs on high degree multi-species fisheries, such as the tropical fisheries in Southeast Asia, is unlikely an achievable option for fishing capacity management.

5.2.3 Territorial Use Rights in Fisheries

Even though ITQs have been strongly recommended as an effective tool to control fishing capacity, difficulties in implementation, particularly territorial use rights in fisheries (TURFs), have increasingly used as an alternative tool.[111] A TURF is a measure to control fishing capacity by removing the condition of common property[112] from fisheries. This measure causes fishers to perform as if property rights for such fishing ground or territory exist.[113] When fishers consider the given territories as their property, they, therefore, have more positive attitude towards conservation of marine resources within such areas. The property rights granted often include the right to restrict or control access to the territory, the right to set the amount and type of utilisation within the territory, the right to obtain the benefits from resource utilisation within the territory, and the right to capture a satisfactory return from the use of the territory.[114] Thus, the ownership of a TURF is not on resources within the territory but on a right to use such resources (i.e., fishing rights). The actual ownership on resources within TURFs still belongs to the territorial country. In some TURFs the right granted can be used to harvest all marine resources within the territory, whereas some TURFs grant the right for harvesting only a single resource or specified resources. The territory of TURFs may include any zones from the surface to the bottom of the sea.[115] For instance, some countries lease tidal and subtidal zones to fishers to harvest mussels

[111] Wilen, Cancino and Uchida, above n 81; Jose P Cancino, Hitrosugu Uchida and James E Wilen, 'TURFs and ITQs: Collective vs. Individual Decision Making' (2007) 22(4) *MARINE RESOURCE ECONOMICS* 391.

[112] Francis T Christy defined common property resources as '...those to which access is both free and open to a set of users or potential users. The set may be made up of fishermen from any country, such as on the high seas; fishermen from any particular country within its EEZ; or fishermen from any particular community. If the country, province, or community does not control access to a fishery, even though it may have the right to do so, the condition of common property exists.' The consequences result from the condition of common property resources includes a tendency to physically waste the resources, economic waste, low incomes of small-scale fishers, and conflicts among fishers. See, Francis T Christy, *Territorial Use Rights in Marine Fisheries: Definitions and Conditions* (FAO, 1982) 2-3.

[113] Ward and Metzner, above n 4, 78.

[114] Christy, above n 112, 4.

[115] Wilen, Cancino and Uchida, above n 81, 239.

and/or oysters.[116] A TURF owner can be a person, a company, a group of persons (e.g., a cooperative, an fishers' association or a fisheries community), a political subdivision (e.g., a city or a province), a national government, or a multinational organisations.[117] Based on this clarification, the EEZs could then be considered as a type of TURFs, which are managed by States.[118] However, most of TURFs are implemented in marine coastal areas.[119]

TURFs can be helpful in controlling fishing capacity for a number of ways. Mainly, they control the inputs employed and outputs generated within the territory. In terms of input controls, TURFs limit fishery entry by protecting the access of outsiders.[120] They also control the use of labour and capital (e.g., fishing gears and methods, fishing vessels), as well as control the fishing effort (e.g., fishing hours, days at sea) employed within the area. In some TURFs, they further place restrictions on outputs by setting the TACs.[121] Additionally, they help to enhance future return of benefits by giving incentives to conserve marine resources and avoid overexploitation.[122]

In order to achieve the great success of any TURFs, a number of conditions are to be considered. First, the most benefits can be achieved where the highest level of exclusivity of the ownership is given.[123] This is due to the fact that issuing exclusive rights to a closed group of users provide incentives to such users to harvest fish without 'race for fish', as well as prevent the entry of non-members.[124] Furthermore, such rights come with TURFs must be long and stable enough to give the users confidence in

[116] Ibid 240.

[117] Ibid 239.

[118] Ibid.

[119] Ibid 240.

[120] Theodore Panayotou, 'Territorial Use Rights in Fisheries' in *Papers Presented at the Expert Consultation on the Regulation of Fishing Effort (Fishing Mortality). Rome, 17–26 January 1983.* (FAO, 1984) vol FIPP/R289 Suppl.2 (En), 214.

[121] Hirotsugu Uchida and Mitsutaku Makino, 'Japanese Coastal Fishery Co-Management: An Overview' in Colin Ralph Townsend, Ross Shotton and Hirotsugu Uchida (eds), *Case Studies in Fisheries Self-governance* (FAO, 2008) vol FAO Fisheries Technical Paper 504, 221, 225.

[122] FAO, 'Papers Presented at the Expert Consultation on the Regulation of Fishing Effort (Fishing Mortality), Rome, 17-26 January 1983, A Preparatory Meeting for the FAO World Conference on Fisheries Management and Development' (FAO, 1984) <http://www.fao.org/docrep/005/AC749E/AC749E00.htm#TOC>.

[123] Christy, above n 112, 4.

[124] Wilen, Cancino and Uchida, above n 81, 244.

getting benefits from their investment.[125] The conditions of natural resource attributes, delimitation of boundaries, technology applied, wealth distribution impacts, government systems, as well as legal and institutional frameworks are also needed to take into account.[126]

In terms of natural resource attributes, it has been found that sedentary resources, such as mussels, oysters, and seaweeds, can easily be managed by TURFs. Species that can grow in an enclosed space, e.g., fish pens and cages, or species that are attracted to, and aggregate around, artificial devices, such as fish aggregating devices (FADs), are favourable for TURFs as well.[127] On the other hand, it may not be easy to effectively implement TURFs on marine stocks that migrate along the coastline, particularly highly migratory species, unless imposing adequate controls through cooperation among those who have neighbouring territorial rights.[128]

With regard to boundaries, territoriality is intensely affected by the level to which the boundaries can easily define and protected.[129] For instance, boundaries can be easily delimitated with a river mouth, a small island or reef, or a lagoon. However, communities or individuals can also define marine territories along beaches, out to coastal area where can be observed easily, and around artificial devices placed on the sea surface.[130] The size of TURFs is important as it should be large enough to provide profits from investment. In terms of the technology used, especially fishing gears and techniques, stationary gears that can be fixed on the sea floor, such as pots, traps, set nets, bottom long lines, can be managed by TURFs on a permanent or seasonal basis, whereas it can be difficult to implement TURFs with mobile fishing gears or techniques that need large areas of the sea to operate, such as trawlers and purse seines.[131]

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[125] Ibid 245.

[126] Christy, above n 112, 7.

[127] Ibid; Gina Auriemma et al, 'Discover TURFs: A Global Assessment of Territorial Use Rights in Fisheries to Determine Variability in Success and Design ' (Bren School of Environmental Science & Management, University of California, Santa Barbara, 21 March 2014) <http://www.bren.ucsb.edu/research/2014group_projects/documents/turf_gp_thesis_21march2014.pdf> 29.

[128] Christy, above n 112, 7; Panayotou, above n 120.

[129] Christy, above n 112, 8; Panayotou, above n 120; Auriemma et al, above n 127, v.

[130] Christy, above n 112, 8.

[131] Ibid.

As TURFS directly affect the income of the owner, either individuals or community, the redistribution of wealth is likely the most important factor for government to consider when creating TURFs.[132] Besides, the government must have efficient authority to protect and enforce TURFs. Alternatively, the users (e.g., community) may be empowered to enforce their own TURFs.[133] Thus, there must be legal, administrative and institutional arrangements that allow government to exercise such authority[134] or convey the authority to users. There would be a tendency for TURFs to break down otherwise.

There are several States that have used TURFs for the purpose of managing their marine resources and fishing capacity. However, TURFs widely applied in coastal fisheries of Chile and Japan is often raised in many studies as the successful measures,[135] and then could possibly be a model for other States.[136] Particularly in Japan, TURFs have been implemented for centuries. They were started in the sixteenth century when coastal communities were provided exclusive rights to harvest marine resources in coastal areas nearby their villages. It was because they had no land for growing rice and fishing was the only source of their livelihood.[137] These groups of fishers, therefore, formed fishery societies in order to protect their responsible areas from outsiders.[138] These specific fishing rights were later legalized as TURFs in 1901 with the promulgation of the Fishery Law.[139] In 1933 when Japan encountered great recession, government established fishery infrastructure (e.g., fishing ports, fishing market places, ice factories, cold storage) in fishery communities in order to improve living conditions of local fishers. These infrastructures facilitated many local fishery societies to get involved with fish marketing auctions and afterward these fishery societies were transformed to

[132] Ibid; Panayotou, above n 120.

[133] Wilen, Cancino and Uchida, above n 81, 245.

[134] Christy, above n 112, 8; Wilen, Cancino and Uchida, above n 81, 244-5; Robert S Pomeroy, 'Community-based and Co-management Institutions for Sustainable Coastal Fisheries Management in Southeast Asia' (1995) 27(3) *Ocean and Coastal Management* 143, 159.

[135] Wilen, Cancino and Uchida, above n 81; Hiroyuki Matsuda et al, 'Fishery Management in Japan' (2010) 25(5) *ECOLOGICAL RESEARCH* 899; Uchida and Makino, above n 142, 221; Cancino, Uchida and Wilen, above n 111, 391; Tadashi Yamamoto, 'Development of a Community-based Fishery Management System in Japan' (1995) 10 *MARINE RESOURCE ECONOMICS* 21.

[136] Nonetheless, only TURFs implemented by Japan are greatly discussed here as an example.

[137] Cancino, Uchida and Wilen, above n 111, 394.

[138] Wilen, Cancino and Uchida, above n 81, 245; Cancino, Uchida and Wilen, above n 111, 394.

[139] Cancino, Uchida and Wilen, above n 111, 394.

fishery cooperative associations (FCAs) based on the Old Fishery Law. Subsequently the 1948 Fishery Cooperative Law granted FCAs the access rights and responsibilities to manage TURFs.[140]

These fishing rights are granted to only inshore fisheries, whereas offshore and high sea fisheries are managed with a license system by either the central or the prefecture government of Japan. The fishing rights are divided into three categories, i.e., (i) common fishing rights; (ii) large scale set net fishing rights; and (iii) coastal aquaculture rights.[141] The first category is only granted to FCAs with ten year term, whereas the other two categories are granted to FCAs and individuals with five year term.[142] There are more than 1,600 FCAs presently managing TURF zones in Japan.[143] Typically FCAs are granted responsibilities to manage all fishery resources within their territory. Such resources are including sedentary benthic species (e.g., clams, mussels, sea urchin, abalone, lobsters) and mobile species (e.g., pelagic fish like mackerel, bonito and groundfish like flatfish, rockfish).[144] Furthermore, FCAs govern across a broad range of fixed fishing gears (e.g., gill nets, bag net) and mobile fishing gears (e.g., purse seines, small trawlers, dredges).[145] Members of FCAs are mainly fishing households and small fishing companies.[146] Each FCA has individual administrative structure and operation ways to manage the fisheries within its territory. FCAs also have functions to take responsibilities in purchasing inputs for fishing operation (e.g., fuel, ice, boxes) and providing insurance and credits to members. Besides, they keep catch records of members and provide them to government authority as sources of official statistics.[147]

Generally FCAs have sub-organisations called fishery management organisations (FMOs) to carry out the operational management.[148] An FMO is typically a group of fishers who operate in the same fishing area and/or the same type of fishery and are

[140] Yamamoto, above n 135, 25-6.

[141] For coastal fisheries in Japan, there are limited entry tools implemented to control fishing capacity, i.e., (i) fishing right for coastal fisheries; (ii) prefecture fishing license for offshore fisheries. See, ibid.

[142] Uchida and Makino, above n 121, 223.

[143] Cancino, Uchida and Wilen, above n 111, 394.

[144] Ibid 397.

[145] Yamamoto, above n 135, 28-9; Cancino, Uchida and Wilen, above n 111, 394.

[146] Uchida and Makino, above n 121, 222.

[147] Ibid 223.

[148] Ibid 224-5; Yamamoto, above n 135, 32.

jointly involved with coastal fisheries management in terms of fishery resources, fishing efforts and fishing grounds according to mutually agreed rules.[149] Nonetheless, if an FCA has a small number of types of fisheries and fishing gears, and targeted species needed to be controlled, the FCA itself can take responsibilities in terms of fisheries management, as an FMO. On the other hand, if an FCA is big in terms of those mentioned, fishers often establish a subgroup by type of gear, target species or fisheries for more effective management.[150] FMOs implement a wide range of capacity management, including setting limits of fishing effort (e.g., days at sea, fishing hours), fishing gear and fishing vessel restrictions, using TACs,[151] closed seasons and areas, and fishing ground rotation.[152]

Nonetheless, although TURFs in Japan generally produce favourable outcomes, they have also had some disadvantages in terms of insufficient scientific information to support multi-species and inter-boundary management.[153] It is because their management is more single species-based management on market species. Furthermore, due to the lack of such information, there are difficulties in managing migratory species stocks that are found in several territories.[154] To overcome these difficulties, collaboration between fishers in areas concerned and adequacy of scientific information provided by authorities are needed.

In sum, it is clearly seen that although TURFS can remove or mitigate the condition of common property from fisheries resources, this can only be achieved to a certain level in marine environment. TURFS, therefore, can relatively control on fishing capacity of marine fisheries.[155] Moreover, even though TURFS can potentially enhance the welfare of fishers, particularly in small-scale fishing communities, they may not be desirable

[149] Uchida and Makino, above n 121, 224-5; Yamamoto, above n 135, 32.

[150] Uchida and Makino, above n 121, 224.

[151] TACs are set by central government, whereas government at prefecture level provides scientific information necessary for setting TACs and also monitors the state of fishery resources in order to ensure the sustainable utilisation. See, Cancino, Uchida and Wilen, above n 111, 393.

[152] Uchida and Makino, above n 121, 225.

[153] Ibid 226.

[154] Ibid. This similar difficulty is also happened with the stocks that have mobile adult and larval life history stages. See, Crow White and Christopher Costello, 'Matching Spatial Property Rights Fisheries with Scales of Fish Dispersal' (2011) 21(2) *Ecological applications : a publication of the Ecological Society of America* 350.

[155] Christy, above n 112, 9.

based on political viewpoint due to the equity issue between who should be given the right to fish and who is not. Theoretically some compensation could be provided to fishers or fishing communities for the loss of resource access, but in practice it is unlikely that such compensation would be economically adequate.[156] Furthermore, where government grants authority and responsibility to local fishers in some cases, this self-governing system may delay the implementation of management measures. For example, it could take long time for fishers to decide about what species they should prioritize on the management, or what type of fishing gears they should firstly control.[157] However, TURFs that are well-managed (e.g., those legalized and implemented in Japan) could be used or adapted as alternative tools to control fishing capacity. Although the coordination cost occurred from operating activities within TURFs cannot be avoided, TURFs could still be practical as long as the benefits given to members and environment are sufficient.

5.2.4 Territorial Use Rights of Fisheries in Thailand's Context

Similar to Japan, Thailand has developed and implemented TURFs as a right-based measure for community-based fisheries management. It is due to the fact that Thailand has followed Japan in adopting such measure. TURFs in Thai fisheries have been granted by government to fishing communities rather than individuals, and these fishing communities have responsibilities to manage fishery resources and control fishing capacity employed within the granted territories. Thus, the succeeding discussion about the implementation of TURFs by Thailand is carried out within the context of co-management and community-based fisheries management as well.

In 1995, TURFs commenced in Thailand when the Thai government, by the Department of Fisheries, attempted to introduce a fishing right system in coastal fisheries through the project titled "Pramong Na Ban", which means "fishing in front of the village".[158] This project was established based on the country's policy of decentralization, which

[156] Ibid.

[157] Uchida and Makino, above n 121, 226.

[158] Supaporn Anuchiracheeva et al, 'Systematizing Local Knowledge Using GIS: Fisheries Management in Bang Saphan Bay, Thailand' (2003) 46(11) *Ocean and Coastal Management* 1049, 1060.

was pushed by the political crisis in 1992.[159] Decentralisation, however, was not legalised until the *1997 Constitution* was promulgated. The *Constitution* aimed to promote the participation of people in the governance under democratic system, both at local and national level.[160] It decentralised the power to local government by granting localities the right to form their own self-government,[161] and all local government organisations had liberty to issue the policy framework for their governance, administration, personnel administration, finance.[162] After the enactment of the *1997 Constitution*, there were a number of new laws issued and law amendments made in order to fulfil the stipulations of the *Constitution* in terms of decentralization.[163] Nonetheless, "Pramong Na Ban" project did not substantially achieve its goal as many fishing communities were reluctant to adopt the project. It was due to the reason that the definition of the use right boundaries was not clearly clarified, and thus, based on the name of the project, most of fishers in communities understood that their fishing areas would be restricted to only the areas in front of their communities.[164] Later, the Department of Fisheries has reattempted to promote TURFs as an approach for community-based fisheries management via pilot projects. The two noteworthy projects

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[159] This political crisis has been known as the 1992 Black May, which is referred to the incident of public protest against General Suchinda Kraprayoon who took the premiership forced by the military and led Thailand into the turmoil. See, Orathai Kokpol, 'Decentralization Process in 1990-2010 In Case of Thailand' (The King Prajadhipok's Institute, <http://www.kpi.ac.th/kpien/index.php?option=com_content&task=view&id=526> 1.

[160] Ibid 4-5.

[161] *The 1997 Constitution of the Kingdom of Thailand*, section 283. It provided that 'Any locality which meets the conditions of self- government shall have the right to be formed as a local government organisation as provided by law. The supervision of a local government organisation must be exercised in so far as it is necessary as provided by law but must be for protecting local interests or the interests of the country as a whole; provided, however, that it shall not substantially affect the principle of self-government according to the will of the people in the locality otherwise than as provided by law.'

[162] *The 1997 Constitution of the Kingdom of Thailand*ibid, section 284. It suggested that 'All local government organisations shall enjoy autonomy in laying down policies for their governance, administration, personnel administration, finance and shall have powers and duties particularly on their own part. The delineation of powers and duties between the State and a local government organisation and among local government organisations themselves shall be in accordance with the provisions of the law, having particular regard to the promotion of decentralisation...'

[163] Such new laws included Determining Plans and Process of Decentralization Act of 1999, Local Government Personnel Management of 1999, Pattaya Administration Act of 1999, Subscription for Proposal of Local Ordinance Act of 1999, Voting for the Removal from Office of Local Executives and Members of Assembly of 1999, and Election of Member of Local Assembly and Local Executives Act of 2002. For law amendments made to harmonize with the 1997 Constitution, they were, for instances, Changing the Status of Sanitary Committee to Municipality Act of 1999, Provincial Administration Organisation (No.2) Act of 1999, Municipal Administration Act (No.10) of 1999, Tambol Council and Tambol Administrative Organisation (No.3) Act of 1999, and Bangkok Metropolitan Administration (No.4) Act of 1992. See, Kokpol, above n 159, 7-8.

[164] Anuchiracheeva et al, above n 158, 1060-1.

were the project of community-based fisheries management implemented in Bang Saphan Bay and the project of integrated coastal fisheries management implemented in Pathew District. These projects will be discussed in great details as case studies of TURFs implemented in Thai fisheries.

The Bang Saphan Bay pilot project was commenced in 1999 by the Department of Fisheries (under the responsibility of the Provincial Fisheries Office) in order to promote the right-based approach (i.e., TURFs) to community-based fisheries management. This project was established to also support the policy given by the Eight National Economic and Social Development Plan (1997-2001) of Thailand that aims to provide 'legal guarantees of the rights of local communities and small fishermen to participate in coastal resource management, as well as the conservation, rehabilitation and maintenance of mangrove forests, sea grass and coral reefs, to ensure sustainable use of coastal resources, especially those related to the fishing industry.'[165] The project site covered 240 square kilometres in coastal waters (five kilometres from the shoreline) of the Gulf of Thailand within the areas of Mae Ramphung and Phong Prasart Sub-districts (Tambons) of Bang Saphan District, and Bang Saphan, Pak Praek and Sai Thong Sub-districts of Bang Saphan Noi District in Prachuap Khiri Khan Province (Figure 5.1). The majority (68 per cent) of the total of 400 fishing households in this area was small-scale fishers. There were nine local fisher groups participating in this project.[166] These groups generally operated small-scale fishing within the project area. This project had an initial purpose to address the problem of illegal fishing conducted by large-scale fishing vessels within prohibited coastal zone that resulted in the conflicts between such large-scale fishers and small-scale fishers in that area. TURFs created under this project, therefore, provided these fisher groups the fishing rights and the

[165] National Economic and Social Development Board Office of the Prime Minister, *The Eight National Economic and Social Development Plan 1997-2001* (1996) section VI, chapter 3(3.3). The Eighth National Economic and Social Development Plan was the first plan that had the guiding principles on people-centred progress and participation, and these principles have been adopted in all National Economic and Social Development Plans onward, including the current one (the Eleventh National Economic and Social Development Plan 2012-2016). See, National Economic and Social Development Board Office of the Prime Minister, *The Eleventh National Economic and Social Development Plan 2012-2016* (2011) viii.

[166] These groups included the groups of Bang Ao-yang, Bang Pak Long Bang Saphan in Mae Ramphung Sub-district, the group of Ban Fai Tha in Phong Prasert Sub-district, the groups of Ban Nong Samed, Ban Pak Klong Bang Saphan Noi in Bang Saphan Sub-district, the group of Ban Kake in Pak Praek Sub-district, and the groups of Ban Chai Thalay, Ban Fang Dang, Ban Bang Berd in Sai Thong Sub-district. See, Anuchiracheeva et al, above n 158, 1052.

rights to manage fishery resources within the territory based on legal framework established by the Department of Fisheries. Thus, the fisher groups formed a network to manage fishery resources over this area. The management put in place was, for example, using limited entry scheme by banning trawlers, push netters, blood cockle cast nets and purse seines (except anchovy purse seines operating in day time) in the territory. Further, with the cooperation of the Department of Fisheries, fisher groups volunteered to monitor illegal fishing in the area. They also implemented conservation activities, such as building cages to keep gravid blue swimming crabs until they spawned the eggs for the purpose of reproduction,[167] and planting mangroves.[168]

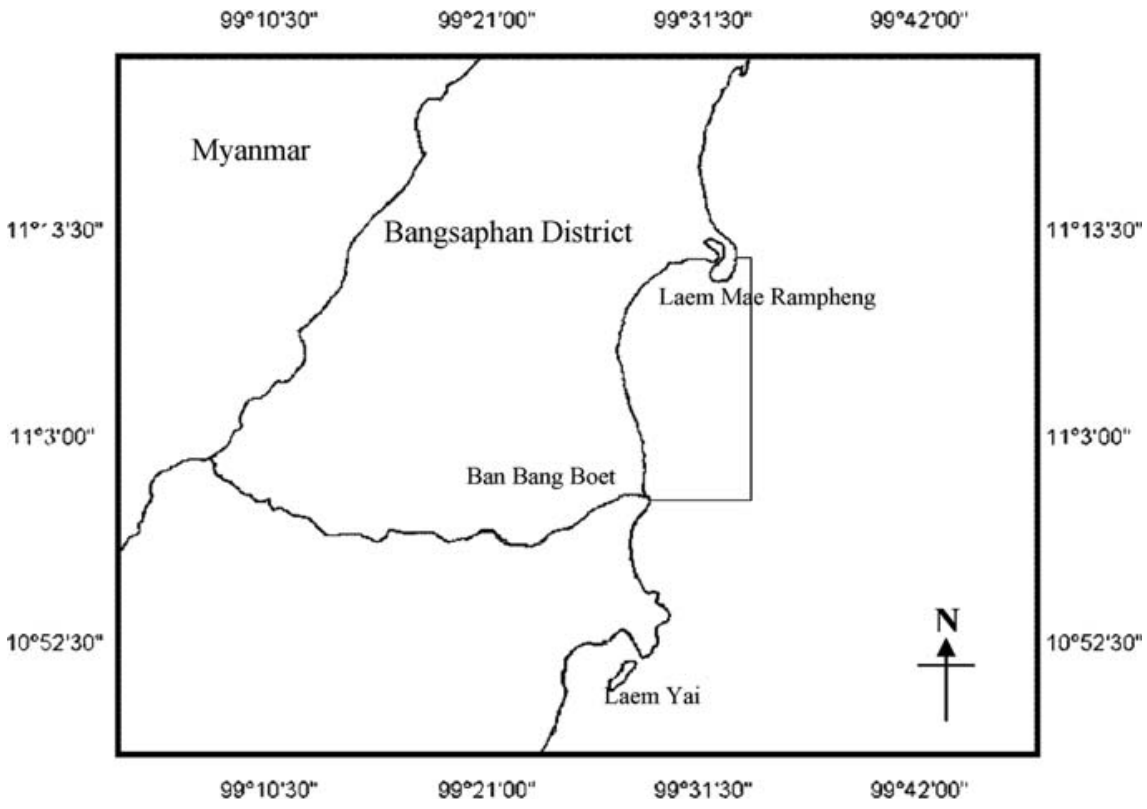

Figure 5.1: Marine territory of Bang Saphan Bay Project in Prachuap Khiri Khan Province

Source of map: Nopparat Nasuchon and Anthony Charles, 'Community Involvement in Fisheries Management: Experiences in the Gulf of Thailand Countries' (2010) 34(1) Marine Policy 163, 166.

[167] Necessary equipments for building cages were provided by the FAO. This activity is widely called 'crab bank'.

[168] Nopparat Nasuchon and Anthony Charles, 'Community Involvement in Fisheries Management: Experiences in the Gulf of Thailand Countries' (2010) 34(1) *Marine Policy* 163, 166.

This project provided favourable results, particularly in terms of settlement of fisheries conflicts through public hearing process, and restrictions imposed on fishing gears in the area.[169] However, based on the fact that this TURF was carried out by the fisher groups with a great assistance from the Department of Fisheries,[170] eventually this arrangement turned to be an obstacle to achieve the successful outcome in long term. Unless TURFs could be solely (or substantially) run by fisher groups, the sustainability of TURF becomes questionable.[171]

Another case study of TURFs implementation in Thailand is the project of Integrated Coastal Fisheries Management in Pathew District (ICFM-PD). This project was jointly conducted by the Department of Fisheries and Training Department of the Southeast Asia Fisheries Development Center (SEAFDEC-TD) during October 2001 to September 2006.[172] The main objectives of this project were: (i) to implement sustainable coastal resources management at the local level; (ii) to restore the coastal fishery resources; and (iii) to mitigate poverty in coastal fishing communities.[173] Based on experiences gained from the Bang Saphan Bay Project, the territory of this project site was demarcated by consultation process among stakeholders in local communities. This process was organised by Chumphon Provincial Fisheries Office.[174] The agreed project area covered a distance of three kilometres of coastal areas of Pakklong Sub-district of Pathew District, Chumphon Province (Figure 5.2) as it also aimed to resolve the conflict

[169] For example, through this process the dispute over the same fishing ground between daytime anchovy purse seiners and light luring anchovy fishing vessels was resolved by arranging different fishing schedule for both groups. According to the outstanding performances, Ban Nong Samed group was given a national reward in 2007, whereas Ban Bang Berd group was given the same reward in 2008. See, ibid.

[170] For instance, the administrative work, including recording technical data, such as fishing production, fishing effort in project areas, was entirely done by the Department of Fisheries. See, ibid.

[171] Ibid.

[172] After December 2006, this project has been solely conducted by the Department of Fisheries and had financial support from the Royal Project Council. See, Department of Fisheries, *Locally-based Coastal Resources Management in Pathew District, Chumphon Province* (19 June 2012) <http://extension.fisheries.go.th/royal_fisheries/index.php?name=project&file=readproject&id=61>; Sei Etoh, 'Fostering the Integrated Coastal Resources Management Approach in Southeast Asia' (2008) 6(1) *Fish for the People* 49, 17.

[173] Etoh, above n 172, 11.

[174] Phattareeya Suanrattanachai, Jinda Petchkamnerd and Jirapa Kamhongsa, 'The Traditional Practice of Fishery Governance in Coastal Zone Management: the Case of Chumphon Province, Thailand' (TD/RES/124, ICRM-PD No.50, SEAFDEC, June 2008) 4.

between small-scale fishers and large-scale fishers (e.g., trawl and push net fishers) who are not allowed to fish within the areas of three kilometres from shoreline.[175]

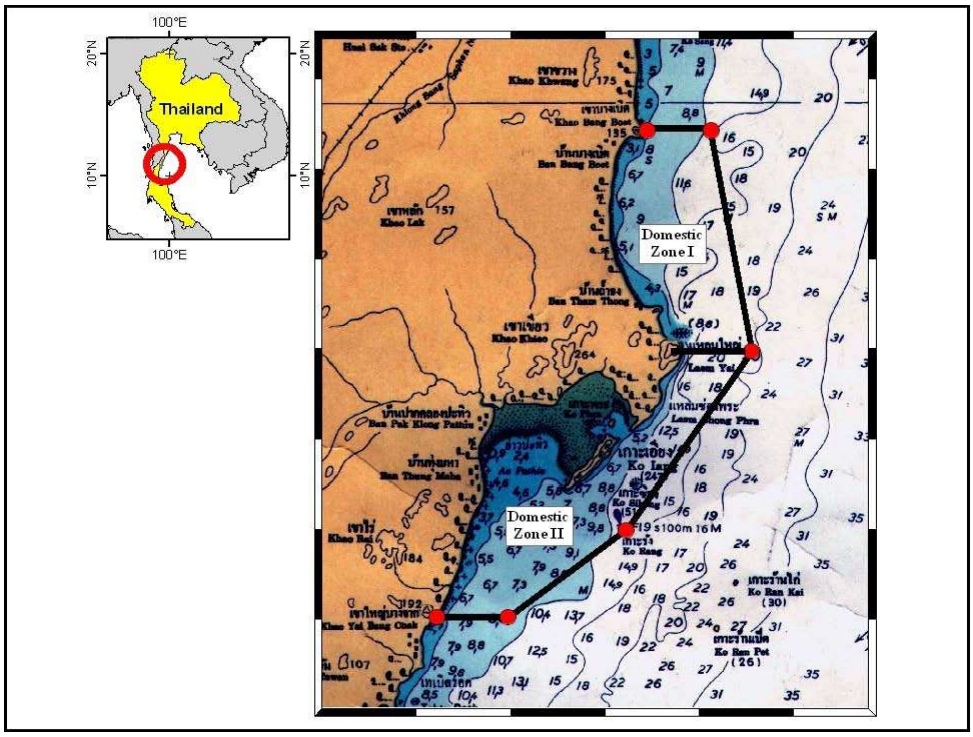

Figure 5.2: Marine territory of the Integrated Coastal Fisheries Management Project in Pathew District, Chumphon Province

Source of map: Phattareeya Suanrattanachai, Jinda Petchkamnerd and Jirapa Kamhongsa, 'The Traditional Practice of Fishery Governance in Coastal Zone Management: the Case of Chumphon Province, Thailand' (TD/RES/124, ICRM-PD No.50, SEAFDEC, June 2008) 4.

With a consensus of stakeholders, the Pakklong Tambon Council and Tambon Administrative Organisation (TAO)[176] subsequently approved the demarcated area of the project.[177] Later, this area was officially recognized with the proclamation of zone

[175] It is based on the Notification of the Ministry of Agriculture and Cooperatives Re: Determination of Areas in which Fishing Appliances, i.e., Trawls, and Push Nets used with Motor Vessels, are Prohibited, given on 20 July B.E. 2515 (1972).

[176] Tambon (Sub-district) Council and Tambon Administrative Organisation (TAO) are originally formed under the promulgation of the Tambon Council and Tambon Administrative Organisation (TAO) Act of 1994. This Act aims to support decentralization policy of government by empowering locals (Tambon) to have self-governance. Nonetheless, in order to harmonize with the 1997 Constitution and improve for more effective decentralization, this Act got amended for a number of times, i.e., in 1995, 1999, 2003 (2 times), and 2009. See, Kokpol, above n 159, 7.

[177] One of responsibilities of the Tambon Council is to safeguard natural resources and environment. See, The Tambon Council and Tambon Administrative Organisation Act of 1994, section 23(4).

demarcation made by the Governor of Chumphon Province in October 2002.[178] Trawls, push nets and dredges with motor vessels are prohibited to operate within the area. The project area was divided into two zones (Figure 5.2).[179] Afterward, for the purpose to resolve the conflicts over fishing areas in Zone II, the zones for aquaculture (e.g., sea bass and blue swimming crab aquaculture), for fishing vessels sheltering during severe weather conditions, and for fishing ground of blue swimming crab fisheries (e.g., crab traps and crab gill nets)[180] were demarcated through the process of public hearings.

Under this project, a local fisher group namely the Pakklong Fisheries Group (PFG)[181] was legally established. This group played an significant role in coastal resource management within the project area. The management measures implemented were, for instance, using less destructive fishing gears (e.g., crab traps with bigger mesh size) to catch blue swimming crabs and building crab bank for these crabs. The PFG has also formed the Local Enforcement Unit to pursue MCS activities within the project area. Nonetheless, as the PFG (or any fisher groups in Thailand) do not have the legal power to arrest the intruders (e.g., trawlers and push netters) it can be difficult in practice hence. Furthermore, although various fisheries management plans were implemented by locals within project's demarcated area, such area is not considered as fully exclusive use rights area. It was due to the fact that non-local small-scale fishers were also allowed to fish within the project area as long as there was no conflict arisen.[182] More importantly, the local small-scale fishers still wanted to have a freedom to fish outside the project area. This same attitude of local fishers is likely found when government attempts to promote fishing rights within demarcated area,[183] which, if not corrected, it could undermine the success of TURFs implementation. However, according to the project evaluation conducted by outsourced consultant, it was concluded that this project achieved significant outcomes, particularly in terms of the establishment of local

[178] The Governor of Chumphon Province issued the Notification of the Ministry of Agriculture and Cooperatives Re: the Prohibition of Certain Kind of Fishing Application in the Determination of Areas of the Locality of Chumphon Province, given on 4 October B.E. 2545 (2002).

[179] Zone I covers 46 square kilometres from Bang Bird Mt. to Khao Lamyai Mt., whereas Zone II covers 70 square kilometres from Khao Lamyai Mt. to Khao Bang Jak Mt. See, Suanrattanachai, Petchkamnerd and Kamhongsa, above n 174, 5.

[180] Etoh, above n 172, 13.

[181] It has about 100 members from different fisheries.

[182] Suanrattanachai, Petchkamnerd and Kamhongsa, above n 174, 5.

[183] It was also happened when the Department of Fisheries attempted to implement 'Pramong Na Ban' project as mentioned earlier.

fisher group, improvement of people living conditions, improvement of the capacity of people and organisation in resource management and development of community by participatory process.[184] Additionally, similar to the Bang Saphan Bay Project, this project also supported the capacity management by strengthening the implementation of limited entry and gear restrictions schemes at local level. These two projects further provided the effective way to settle the fisheries disputes arising in fishing communities.

Based on the favourable outcomes of the two projects aforementioned, the Thai government by the Department of Fisheries have adopted this effective management approach (i.e., TURFs and community-based fisheries management) into the Master Plan on Marine Fisheries Management of Thailand. Such approach is heavily stated under the Strategy 1, effectively improving the system of marine fisheries management and the co-management, of the Master Plan, focusing on 'the modernisation of legal parameters pertaining to the management of marine fisheries,[185] the demarcation of fishing grounds, right-based fisheries, fisheries co-management, and fishing capacity controls.'[186] However, the participation of fishers and fishing communities is critically required in order to pursue this approach effectively.

Particularly the demarcation of fishing grounds, it is essential to clearly demarcate the area with equity through the consultation process participated by stakeholders including local administrative and fisheries organisations. It is also needed to demarcate the provincial maritime boundaries in order to facilitate the fisheries management implemented by province or a group of provinces that having similar maritime ecosystem.[187] These clear boundaries would chiefly support the implementation of right-based fisheries management, TURFs in particular. Additionally, as an effective approach for right-based fisheries management, the Master Plan strongly encourages local administrative organisations, fisher organisations and coastal communities to actively participate in the co-management, including the operation of MCS supported by the government.[188]

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[184] Etoh, above n 172, 12.

[185] In terms of the modernisation of legislation, the Master Plan requires reviewing and revising the outdated fisheries laws and regulations, as well as strengthening the enforcement of such legislation.

[186] *The Master Plan*, strategy 1.

[187] *The Master Plan*, strategy 1, measure 2.

[188] *The Master Plan*, strategy 1, measure 3.

To achieve such goal, since 2007 the Department of Fisheries, by Fisheries Administration and Management Bureau, has conducted a project of developing a fishing community prototype for fisheries management, aiming to establish effective mechanism for fishers to participate in community-based fisheries management (e.g., through consultation process) and MCS activities (with government support) in selected fishing communities. Successful fishing communities will be used as a model to apply for other fishing communities in Thailand.[189] This project has attempted to promote the property right concept on fisheries resources within fishing community areas, and then fishing communities should be able to manage their own fisheries resources.[190] Participation process is used for all activities under the project.

The procedure of the project implementation consisted of four main activities including: (i) selecting fishing communities that have potential in supporting community-based fisheries management. For example, there are existing fishers groups in such fishing communities, or fishers in fishing communities are willing to work together as a group; (ii) seeking fishing communities' needs in terms of activities for fisheries resources management in their communities and selecting committees for particular activity through consultation process;[191] (iii) preparing action plan for each activity; (iv) pursuing action plan of each activity; and (v) conducting evaluation and report of each activity.[192] In parallel, the trainings in coastal fisheries management have been

[189] *The Master Plan*, strategy 1, measure 3, project 1; Fisheries Administration and Management Bureau Department of Fisheries, 'กิจกรรมโครงการเสริมสร้างการจัดการชุมชนประมงต้นแบบ [Project of Building Model Fishing Communities for Fisheries Management]' (2008).

[190] The total of 200 fishing communities (both freshwater and coastal fishing communities) was targeted to participate by 2011. See, ibid.

[191] It was found that selected fishing communities generally had similar needs, such as zone demarcation for fisheries resource management within their community areas, establishment of crab banks, cooperation in fisheries enforcement (patrolling) between government officers and fishing communities, fisheries resource enhancement by releasing fish fingerings, and increasing habitats for marine species. See, ibid.

[192] Fisheries Administration and Management Bureau Department of Fisheries, 'โครงการเสริมสร้างการจัดการชุมชนประมงต้นแบบ รายงานผลการดำเนินงาน รอบ 6 เดือน (ตุลาคม 2553-มีนาคม 2554) [Project of Building Model Fishing Communities for Fisheries Management: 6 Month Progress Report (October 2010-March 2011)]' (2011); Fisheries Administration and Management Bureau Department of Fisheries, 'สรุปผลการดำเนินโครงการเสริมสร้างการจัดการชุมชนประมงต้นแบบด้านทะเล ประจำปี 2553 [Report of Project of Building Model Fishing Communities for Fisheries Management Year 2010]' (2011); Fisheries Administration and Management Bureau Department of Fisheries, 'สรุปผลการดำเนินโครงการเสริมสร้างการจัดการชุมชนประมงต้นแบบ ประจำปีงบประมาณ 2552 [Report of Project of Building Model Fishing Communities for Fisheries Management Year 2009]' (2010) <http://www.fisheries.go.th/management/marine_management/webpage/final_tonbab52/%E0%B8%AA

organized for the officers of local administrative organisations, so that they will be able to support the implementation of such management at local level.

Generally the evaluation of the project suggested the favourable outcomes including increased income of fishers in participated fishing communities due to the enhanced fisheries resources within project area; awareness of autonomous community builded among fishers; unity created through participatory processes; and social conflicts mitigated by complying with agreed rules. Nonetheless, there were a number of difficulties confronted too. For example, it took some time for stakeholders to understand the concept of participation process, resulting in the delay of project activities. Further, in terms of rule enforcement, as fishing communities were not empowered to solely do it, limited government budget and manpower undermined the effectiveness of this activity.[193]

In conclusion, Thailand has adopted the concept of TURFs into marine coastal fisheries and been implementing the projects to promote TURFs, focusing on small-scale fishing communities. Generally, the projects suggested the positive results including strengthening the input controls of fishing capacity in local areas. However, improvements, such as strengthening enforcement, increasing participation of local organisations (e.g., TAO), urging the collaboration among nearby communities, are still needed in order to achieve the success in long term. Furthermore, legal framework that supports TURFs establishment is also required.

5.2.5 Co-management and Community-based Fisheries Management

Although the definition of "co-management" is not definite,[194] it, however, covers a wide range of possible systems that involves the sharing of management responsibilities between States and communities.[195] In other words, it means that the authorities share

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%E0%B8%A3%E0%B8%B8%E0%B8%9B%E0%B8%9C%E0%B8%A5%E0%B8%9B%E0%B8%B552.htm>.

[193] Department of Fisheries, above n 192.

[194] Organisation for Economic Co-operation and Development, above n 12.

[195] Steve Cunningham and Dominique Greboval, *Managing Fishing Capacity: A Review of Policy and Technical Issues* (FAO, 2001) 28; Robert S Pomeroy and Meryl J Williams, *Fisheries Co-Management and Small-scale Fisheries: A Policy Brief* (ICLARM, 1994) 7. Community can be defined geographically by political or resource boundaries or socially as a community of individuals with common interests. For example, the geographical community is usually a village, which is the lowest governmental administrative unit; a social community can be a group of fishers using the same fishing gear or a fisher

some of their powers in resource management with user groups (Figure 5.3). This sharing can be in a wide range from very limited power sharing to community-based management systems,[196] which is a fundamental component of co-management.[197]

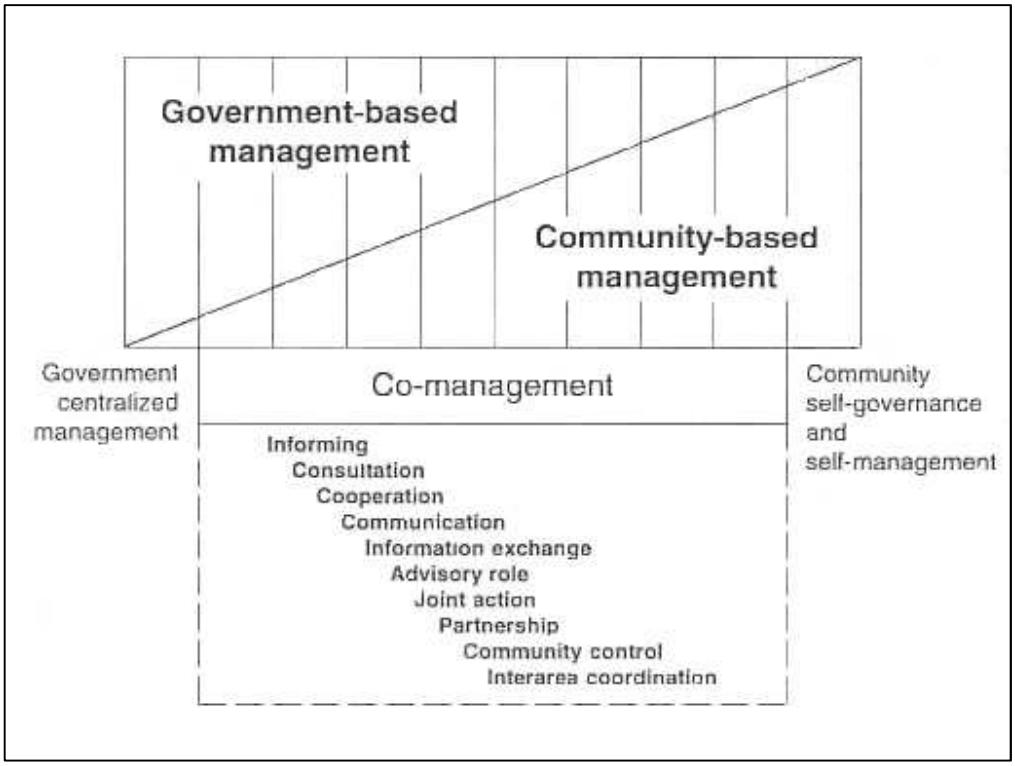

Figure 5.3: The hierarchy of co-management arrangements

Source of figure: Fikret Berkes, 'Co-management: Bridging the Two Solitudes' (1994) 22(2-3) Northern Perspectives 18.

Co-management has been increasingly adopted in many States as fisheries managers realise that cooperation of stakeholders is the key factor of the success of any management measure implementation.[198] Further, it helps to reduce transaction costs[199]

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organisation. See, Robert S Pomeroy and Rebecca Rivera-Guieb, *Fishery Co-Management : A Practical Handbook* (CAB International, 2005) 9.

[196] Greboval and Munro, above n 1, 34.

[197] Pomeroy and Rivera-Guieb, above n 195, 16.

[198] Pomeroy and Williams, above n 195, 3.

[199] In this case transaction costs refer to the costs occurred when community applies ownership rights over resources and enforces such exclusive rights. See, Ruangrai Tokrisna, Pongpat Boonchuwong and Penporn Janekarnkij, 'A Review on Fisheries and Coastal Community-based Co-management Regime in Thailand' (Paper presented at the The International Workshop on Fisheries Co-management, Penang, Malaysia, 23-28 August 1999) <http://www.worldfishcenter.org/Pubs/Way%20Forward/15%20tokrisna.pdf>.Management transaction costs within fisheries can be categorised into four groups: '(i) information costs (data collection, stock and fisheries assessment, research and distribution of information); (ii) decision-making costs (rule-making, including allocation of fishing rights and implementation of regulations); (iii) operational

in fisheries resource management shouldered by government.[200] It also becomes clear that the government, usually with limited budget and manpower, cannot address all fisheries problems alone. Local communities, therefore, must play an important role in solving local problems. In doing so, communities must be authorised to decide and take actions to address such problems.[201] In fisheries, community-based management refers to the establishment of partnership in community among local resources users (i.e., fishers, formal or informal fisher organisations), government (e.g., local government agencies), other stakeholders (e.g., vessel owners, fish traders) and external agents (e.g., academic, NGOs) for the purpose of sharing responsibilities and authorities in managing such fisheries resources.[202] To compliment community-based fisheries management (CBFM) systems, there are many factors needed to be considered, for examples, how to establish user groups; what rights and responsibilities are being transferred to each group; how they should operate; what mechanism needed to settle the disputes between and within groups; what to do if a group does not represent the best management approach.[203]

Thus, in order to effectively implement CBFM scheme, in given community there should be/have:[204] (i) an exclusivity over the resources. For example, fishing areas for the resources should be demarcated; (ii) a high degree of dependence on the resources by community members. It is because if the resources are the only source of income, community members or local fishers will realise the importance of the resources and are willing to involve in the CBFM in order to enhance and protect such resources; (iii) community members' ability to declare the rights in management on either formal or informal bases.[205] Such rights, however, must be clear, certainty, exclusive, enforceable,

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costs (the costs of undertaking the fishing activities); and (iv) monitoring, control and enforcement costs (determined by the complexity of the regulations and geographical distribution of fishing activities and how fishers perceive the legitimacy of the regulations).' See, Jesper N Raakjær, 'An Analytical Framework for Studying: Compliance and Legitimacy in Fisheries Management' (2003) 27(5) *Marine Policy* 425, 429.

[200] Douglas C Wilson et al, 'Cross-scale Linkages and Adaptive Management: Fisheries Co-management in Asia' (2006) 30(5) (Sep) *Marine Policy* 523, 525.

[201] Pomeroy and Rivera-Guieb, above n 195, 4.

[202] Ibid 8.

[203] Cunningham and Greboval, above n 195, 28.

[204] Greboval and Munro, above n 1, 34.

[205] Ibid. Also, it is essential that the community right can be enforced. If the transaction costs are not too high, community-based management may be effectively implemented. On the other hand, if the costs are too high, the effective outcomes may be undermined. See, Ward and Metzner, above n 4, 77-8.

and legal recognition and protection;[206] (iv) respect for the group's leadership by all community members.[207] Where the local organisation is weak, additional costs are needed to strengthen and develop management capability of community, which may take a long time. The state of fishery resources could be worsen in the meantime;[208] and (v) supportive agencies, both government and nongovernment. Particularly, government agencies should consider establishing legal framework that grants community the legitimate power.[209] Additionally, appropriate political groups in local level, such as fishers' cooperative, should be encouraged to establish.[210] This cooperative will provide an automatic incentive favouring stewardship of the resource to fishers within community.[211]

A formal agreement is developed by the stakeholders participating in the co-management through consultation and negotiation process. Therefore, co-management can also be called 'participatory, joint, stakeholder, multi-party or collaborative management'. [212] Co-management is a participatory management strategy, providing 'forum or structure for action on empowerment, rule making, conflict management, power sharing, social learning, dialogue and communication, and development among the partners'.[213] Consensus-driven process is the core of co-management, by taking into account 'the differences of values, needs, concerns and interests' concerned in resources management.[214] Partnerships, duties and responsibilities of stakeholders are also carried

[206] Jonathan M Lindsay, 'Creating a Legal Framework for Community-based Management: Principles and Dilemmas' in S A Dembner and A Perlis (eds), *Unasylva - No. 199 - Decentralization and Devolution in Forestry* (1999) . Commonly, the strong local support for co-management is found in community where members want the government to develop property rights in order to exclude outsiders. In some States, such as Bangladesh, the fishers preferred to cooperate with the government when they were given a greater role in resource management, the government still significantly involved in allocating and enforcing rights though. See, Wilson et al, above n 200, 524-5.

[207] Cunningham and Greboval, above n 195, 28.

[208] Tokrisna, Boonchuwong and Janekarnkij, above n 199, 3. However, it should also be careful that where local political structures are weak, the locally influential individuals, who claim to represent the community, may take advantages of community's benefits. See, Milner-Gulland and Mace, above n 2, 163.

[209] Tokrisna, Boonchuwong and Janekarnkij, above n 199, 5.

[210] Milner-Gulland and Mace, above n 2, 163.

[211] Clark, above n 22, 9.

[212] Pomeroy and Rivera-Guieb, above n 195, 8.

[213] Ibid.

[214] Ibid 10.

out along the process. Due to the broad scope of co-management, its implementation can then be complicated, expensive, and time-consuming.[215]

The implementation of CBFM can be considered as an approach to address an issue of common property since a well-developed CBFM refers to the grant of property rights over the resources for the community's members on a collective base.[216] This scheme has many characteristics similar with those found in ITQ schemes-corporate fisheries. For instance, both schemes provide the rights to fish for fishers. Thus, the consequences of this scheme to fishing capacity control are expected the same as ITQs'.[217] In order to gain the most benefit from the fishery, the community should put an effort to not only conserve the resources, but also reduce the economic loss arisen from excessive capacity. However, as the objectives of user groups in community could be in conflict,[218] it is important that all user groups are represented in the process in order to set the management objectives with consensus of all user groups.[219] Incentive-blocking measures can be used to address capacity problem within CBFM,[220] but, as CBFM commonly has a wide scope of interests, the capacity issue may not adequately addressed.

The systems of co-management and CBFM have been applied in many States with a desirable result in controlling and reducing capacity,[221] such as in Japan and the United Kingdom (UK). As greatly discussed in Section 5.2.2, TURFs in Japan have played an important role in not only controlling fishing capacity but also supporting the CBFM.[222]

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[215] Ibid.

[216] Greboval and Munro, above n 1, 34.

[217] Ibid.

[218] For example, some groups may have goal to increase the employment in fisheries, whereas other groups may want to control fishing capacity.

[219] Symes, above n 86, 185.

[220] Ward and Metzner, above n 4, 78.

[221] Ibid.

[222] Japan is one of the countries who has the oldest and the most successful fishery co-management regimes. The key points in the evolution of its present fisheries institutions and management consists of: '(i) the early feudal era (1603-about 1700), communities controlled adjacent coastal areas and were responsible for establishing rules for exploitation in these areas. The offshore areas were open access for anyone; (ii) late feudal era (about 1700-1868), fisheries became labour intensive and capitalized. Fisheries were controlled by a few wealthy operators. Large scale operators exploited offshore areas with their own rules; (iii) modernisation (1868-1901), government tried to introduce top down management systems but failed. They returned to have customary arrangements with communities controlling adjacent coastal areas; (iv) Meiji fisheries law (1901-1945), fishing rights were granted to local societies and individuals.

For the UK, on the other hand, community-based management has been implemented as a form of catch allocation called Fixed Quota Allocation (FQA), which was evolved from Sectoral Quota (SQ), and managed by Producers Organisations (POs). The FQA is a percentage allotment of all quotas for a single species that can be harvested within a specific area. It was determined by considering history records of vessels during 1994-1996. Each registered vessel which has recorded its landing of such quota species during the reference time period will receive a fixed number of FQAs. POs firstly managed fish stocks subject to TAC restrictions in 1985. Currently, there are 19 POs in the UK that are responsible to distribute fishing quota to 95 per cent of the UK vessels on behalf of the government. Pooled or individual quotas (IQs) are two main systems in managing quotas by POs in the UK.[223] Thus, based on experiences of Japan and the UK, it can be seen that to successfully implement CBFM for the purpose of capacity controls may require the implementation of other schemes (e.g., IQs) to support.

The co-management system does not always guarantee the successful outcome in controlling fishing capacity. For instance, the co-management system implemented by National Marine Fisheries Service (NMFS) and the Fisheries Management Council of the United States has not resulted in the success of controlling capacity in domestic fisheries.[224]

However, taking the aforesaid benefits into account, the effective co-management and CBFM should be considered as an alternate tool to deter excess fishing capacity, particularly in inshore-coastal fisheries, such as small-scale artisanal fisheries where having strong and efficient community organisations.[225] Commonly, the rights of small-scale fishers are allocated in terms of space as community incentives for co-management are usually based on the degree of fisheries resources protection from

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Offshore licenses were given to both individuals and representatives; (v) current fisheries law, fishing rights were granted to both Fisheries Cooperative Associations and individuals to exploit coastal areas. Fishing licenses are granted to individuals for exploiting offshore areas.' See, Mitsutaku Makino and Hiroyuki Matsuda, 'Co-management in Japanese Coastal Fisheries: Institutional Features and Transaction Costs' (2005) 29(5) *Marine Policy* 441, 442.

[223] Andersen, above n 14, 55-6.

[224] But, there is a number of fishery groups in the United States successfully adopting capacity corrected measures, such as the wreckfish fishery in the southeastern region, the halibut and sablefish fisheries in the northwest and Alaskan fisheries, as well as the surf clam fishery in the mid-Atlantic region. See, Ward and Metzner, above n 4, 78.

[225] Greboval and Munro, above n 1, 34.

outsiders.[226] But, in case of fisheries stocks expanding to more than one community's area, all concerned communities will need to cooperate. Otherwise, allocating catch rights instead of, or in addition to, spatial rights to fishers might be preferable.[227] For some States where co-management scheme may not be feasible, it is also useful to carry out a research project aimed to find out what situation this scheme can be a sustainable and efficient management measure, as well as how it can be implemented effectively for each given State.[228] Nonetheless, it is essential to note that co-management and CBFM can be successfully implemented only when supportive legislation, policies, rights and authority structure are addressed appropriately.[229]

5.2.6 Co-management and Community-based Fisheries Management in Thailand's Context

Clearly, the nature of open access of Thai fisheries has led to coastal fisheries resources depletion and substantially affected small-scale fishers as they have less capability to compete over fisheries resources with large-scale fishers. Although the Thai government has attempted to implement several management programs in order to address issues about fisheries resources depletion and conflicts among fishers, the successful outcomes were unsustainably obtained. This is due to not only the nature of common property of fisheries resources as mentioned, but also the inadequacy of effective monitoring and enforcement conducted by government, which is mainly because government cannot afford the high cost of such operations over the long coastal line of Thailand.[230] According to the failures of fishery management programs implemented in the past, Thailand has adopted co-management, CBFM in particular, as an alternate tool to solve such fisheries issues. Specifically, the CBFM approach has been used to rehabilitate coastal fisheries; settle the conflicts between small and large-scale fishers; promote the unity within fisheries community; assure the sustainable incomes for coastal fisheries communities; and also transfer the cost of enforcement

[226] Wilson et al, above n 200, 523.

[227] Cunningham and Greboval, above n 195, 28.

[228] Robert S Pomeroy, Brenda M Katon and Ingvild Harkes, 'Conditions Affecting the Success of Fisheries Co-management: Lessons from Asia' (2001) 25(3) (May) *Marine Policy* 197, 198.

[229] Ibid 199.

[230] Tokrisna, Boonchuwong and Janekarnkij, above n 199, 6-7.

from government to the beneficiaries, particularly in terms of fishing capacity controls within the community area.[231]

Additionally, as the *1997 Constitution* has substantially provided the decentralised power to the local level in Thai society, a number of new laws and law amendments have been issued to support and harmonize the Constitution. People at the local level are also encouraged to participate in the governance or having self-government. CBFM scheme is therefore promoted accordingly. Further, the Thai government included CBFM in the Eight National Economic and Social Development Plan (1997-2001) for the first time. This National Plan has been the guideline for afterward fishery policy of Thailand.[232] Nonetheless, the *1997 Constitution*, the *Fisheries Act B.E. 2490 (1947)* and relevant fisheries regulations do not grant fisheries communities explicit enforcement authority. This, therefore, induces difficulties in CBFM implementation.

To address this issue, in 2007 the Department of Fisheries submitted the new fisheries law to the Cabinet[233] in order to replace the *Fisheries Act B.E. 2490 (1947),* which is out-of-date and does not support the co-management concept. After many years of consideration, the proposed fisheries law has been finally approved, and become the *Fisheries Act B.E. 2558 (2015).*[234] This new Act requires the establishment of the Provincial Fisheries Committees, consisting of representatives from government and local private sectors, which include fisheries community associations in particular province.[235] These committees have a main task to consider and propose a fishery policy or management and conservation measures, which are needed to govern the fisheries resources in their competent area, to the National Fisheries Policy Committee[236] and the Minister of Agriculture and Cooperatives Ministry to consider.[237]

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[231] Donna J Nickerson (ed), *Community-based Fisheries Management in Phang-nga Bay, Thailand. Proceedings of the National Workshop on Community-based Fisheries Management Organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996* (FAO, 1998) 2.

[232] Ibid 3.

[233] This Fisheries Bill was firstly drafted in 1999 but it took many years for being considered by the Cabinet due to several changes of the Thai government.

[234] The enactment of the *Fisheries Act B.E. 2558 (2015)* is also discussed in details in Chapter 2 Section 2.5.2.

[235] *Fisheries Act B.E. 2558 (2015)* section 19(1).

[236] *Fisheries Act B.E. 2558 (2015)* section 13.

In order to support this arrangement, the Act also requires the Department of Fisheries to encourage and support the establishment of fisheries community associations.[238] Furthermore, the Act empowers the Minister to appoint representatives of fisheries community associations as the assistants of fisheries officers to enforce the Fisheries Act.[239] Therefore, these provisions, for the first time, provide fisheries communities the legitimate power to govern fisheries resources management in their areas, which greatly support the implementation of co-management and CBFM in Thai fisheries. Nonetheless, although the *Fisheries Act B.E. 2558 (2015)* has been approved recently as a new fundamental fisheries law, subordinate legislation is still needed. Thus, to issue appropriate subordinate legislation is essential to be carried out as soon as possible.

In the past two decades, a number of CBFM programs have been established in Thailand by government and non-government agencies. Apart from the pilot projects aforesaid under TURF scheme, a remarkable CBFM program established by the Department of Fisheries is the DOF/BOBP Community-based Fisheries Management Project in Phang-nga Bay. It was conducted during 1995-1999 under the Bay of Bengal Program and funded by the FAO.[240] This project aimed to promote the approach of co-management for integrated coastal fisheries management in Phang-nga Bay,[241] where the natural resources have been deteriorated by overfishing and pollution and the conflicts between small-scale and large-scale fishers over the same fishing grounds have been arisen for a long time. In the early 1990s, the Department of Fisheries firstly addressed these problems by implementing the project of small-scale fisheries

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[237] *Fisheries Act B.E. 2558 (2015)* section 20(1)(2). In fact, the *Fisheries Bill B.E. 2555 (2012)* originally contained provisions of the establishment of the local fisheries committees that were empowered to issue fisheries regulations used to govern fisheries resources at local level. However, these concerned provisions were later removed by the Council of State of Thailand based on the reason that such provisions did not clearly prescribe the process carried out to issue the fisheries regulations. Instead, the Council of State of Thailand suggested the Department of Fisheries to support the participation of fisheries communities in preparing the policy of fisheries development in Thai waters, as well as to educate and assist fisheries communities in sustainably managing, maintaining, conserving, rehabilitating and utilizing resources in their area.

[238] *Fisheries Act B.E. 2558 (2015)* section 9(2).

[239] *Fisheries Act B.E. 2558 (2015)* section 12.

[240] Donna J Nickerson-Tietze, 'Community-based Management for Sustainable Fisheries Resources in Phang-nga Bay, Thailand' (2000) 28(1) *COASTAL MANAGEMENT* 65.

[241] Phang-nga Bay is located on the Andaman Coast of Thailand and surrounded by three provinces, i.e., Krabi, Phuket and Phang-nga. This 1,960 square kilometres Bay is considered as one of the most significant bay of the world due to its abundance of natural resources. See, Kee-Chai Chong, Somsak Chullasorn and Jate Pimoljinda, *Successful Co-Management of Phang-nga Bay Fisheries through Fisheries Community Bonding* (26 January) <http://srdis.ciesin.columbia.edu/cases/india-001.html>.

development in all small-scale fishing communities along the bay. The activities of this project included providing community amenities, such as power and supply system, fish landing sites, vessel engine repair and maintenance place; installing artificial reefs; promoting the use of non-destructive fishing gears, supporting investment in coastal aquaculture and cage culture; and forming the community organisation by educating and training fishers to have necessary skills for being self-organized. But, due to the lack of participatory approach in these activities, the anticipated outcomes of the project were inadequately obtained. Based on these lessons learned, the Department of Fisheries has therefore modified their approach from the conventional government driven top-down approach to the community-based fisheries management system as it was used for the DOF/BOBP Project in Phang-nga Bay.[242]

This DOF/BOBP project was started by identifying and prioritising the issues for management at the national workshop on community-based fisheries management in Phang-nga Bay. This workshop was attended by local fishers, socio-economic and fishery scientists of the Department of Fisheries, institutions, NGOs,[243] and representatives of BOBP and FAO. The factors contributing to decreasing incomes of fishers and increasing social problems in communities were identified as: (i) operation of destructive fishing gears, particularly trawlers and push netters; (ii) conflicts between small-scale and large-scale fishers over fisheries resources; (iii) deterioration of coral reef areas, sea grass beds, and mangrove forests; (iv) overexploitation of living marine resources; and (v) more poor water quality.[244] Thus, based on the workshop outcome, the DOF/BOBP project implemented CBFM activities focusing on not only fisheries problems (e.g., overfishing, destructive fishing gears, fisheries conflicts among fishers), but also the environmental components that put the impact on the abundance of fisheries resources, such as the deterioration of mangroves, coral reefs, seagrass beds, and water quality.[245]

[242] Ibid.

[243] The remarkable NGO was the NGO "Yad Fon" or Raindrop Association, who has involved in the protection of local marine resources in the bay for years. See, Nickerson-Tietze, above n 240, 67.

[244] Nickerson, above n 231.

[245] Nickerson-Tietze, above n 240, 68.

Principally, the DOF/BOBP project aimed to build necessary skills of resource management to fisheries communities in order to eventually transfer them the fisheries management responsibilities, such as granting fishing permit to eligible fishers, fishing zoning, and for the long term, exercising enforcement power. Initially, the local management structure or working village committees were established in 11 villages in Phang-nga and Phuket Provinces with the assistance of the project, and later expanded in more than 35 villages. The committees consisted of fishers and village leaders, who had an important role in dispute settlement among fishers. The committees had responsibilities in making a decision on the implementation of fisheries management measures, allocation of budget and, in some villages, administering revolving funds, whereas the Department of Fisheries and academics provided them technical knowledge in terms of fisheries resources and socio-economic status in Phang-nga Bay areas. Village committees had monthly meetings and they had bimonthly meetings with project partners, i.e., the Department of Fisheries, academics, local NGOs, and the FAO. These meetings were served as a forum to share scientific data and information and discuss about any progress of the project.[246]

This CBFM project activities further included replanting mangrove and seagrass, establishment of conservation areas, as well as educating fishers and school children about resource conservation and management in order to ensure the effective compliance (particularly in terms of banning push netters and trawlers), and monitor the changes of fisheries and habitat in Phang-nga Bay. Specifically, the ban of push netters and trawlers was the first collaborative management activity between government and the communities along the bay under this project. The Governor of each province surrounding the bay issued the notification that put the ban of push netters and trawlers into force.[247] This regulation supports the ministerial regulations governing the fisheries in Phang-nga Bay, which providing that any motorized-trawlers, push netters[248] and purse seiners[249] are prohibited to operate within the areas of Phang-nga Bay.

[246] Ibid 69.

[247] Ibid.

[248] Notification of the Ministry of Agriculture and Cooperatives Re: Demarcation of prohibited area for fishing operation of trawls and push nets in Phang-nga Bay, given on 14 December B.E. 2541 (1998).

[249] Notification of the Ministry of Agriculture and Cooperatives Re: Determination of some areas of Satun Province in which fishing appliances, i.e., trawls, and push nets used with motor vessels, are prohibited, given on 29 January B.E. 2551 (2008).

There were a number of valuable lessons gained from this DOF/BOBP project. Most importantly, it was found that a combination of restrictions was essentially required to achieve the effective result of project activities, particularly banning trawlers and push netters in the bay. Such combination included the increased enforcement by officers as fishers or communities have not been granted the authority to arrest the violators; a campaign for enhancing intensive awareness and education; and economic incentives, such as a subsidy program for substituting push nets with gill nets.[250] Additionally, the result suggested that the governance process, which stakeholders have a solid working partnership will be able to effectively overcome conflicts arisen, as well as assure the project planning, management and implementation that will achieve the project goals and adjectives.[251]

In short, the project results affirmed that the level of fisheries enforcement is a fundamental factor of the effectiveness of fishing capacity controls, particularly input control. As such, to empower enforcement authority to fishers and fisheries communities could be considered as an option to strengthen the enforcement in coastal fisheries. Nonetheless, it is essential to be aware that granting power to execute and enforce fisheries regulations to fisheries communities can be done only when legal and political environment is supportive. Thus, this issue could be addressed when the Fisheries Act B.E. 2558 (2015) is put into force, and its supplementary laws are issued.

There was another significant co-management project recently conducted in Thailand, namely the Coastal Habitats and Resources Management project (CHARM). It was a five-year (25 November 2002 to 24 November 2007) collaborative project of the European Union (EU) and the government of Thailand by the Department of Fisheries.[252] This project was established in two areas, i.e., Ban Don Bay in the Gulf of Thailand[253] and Phang-nga Bay in the Andaman Sea.[254] A total of 24 Sub-districts

[250] Nickerson-Tietze, above n 240, 69.

[251] Ibid 71.

[252] The overall work plan of this project consisted of three phases including Phase I: Preparation (2003); Phase II: Implementation (2004-2007); and Phase III: Consolidation (2007). See, CHARM, 'Successes and Lessons Learned for Future Coastal Resource Co-Management from CHARM's End-of-Project Workshop' (22-24 August 2007) <http://www.charmproject.org/cms/Final_work/EOPWSproc.pdf> 3.

[253] Ban Don Bay was selected as it has very productive ecosystems but with limited protection interest. The protection issues are basically related to sustainable production, such as conservation of breeding areas. See, CHARM, 'CHARM Achievements Summary' (February 2008) 4.

(Tambon) located in Surat Thani, Phang-nga, Phuket, Krabi and Trang Provinces participated in the project. Both project areas have not only important ecosystems but also problems regarding 'natural resources allocation, weak local organisations, overlapping responsibilities and conflicting jurisdiction of coastal resources among key government agencies'.[255] Therefore, this project aimed to develop and implement the coastal habitats co-management framework and scheme for these areas, which can also be a model for other areas of Thailand.[256] Simply put, it targeted to change the perceptions and attitudes of fishers or fisheries communities from being a user to a fisheries manager through the operational measures of participation, resource co-management, and lessons learned.[257]

Overall, the CHARM project supported hundreds of local groups in project sites to carry out fisheries projects, coastal resource management activities, livelihood endeavours, MCS, and environmental conservation. For examples, they supported 167 groups for aquaculture projects, 38 groups for fisheries development, 65 groups for changing destructive fishing gears, and 51 groups in MCS.[258] One of the valuable outcomes of this project was the enhancement of the state of fisheries resources in Phang-nga Bay, which has gradually risen during 1997-2005 after the banned area for trawlers and push netters has been expanded in 1998.[259] This improvement was substantially contributed by the strengthened MCS with the collaboration between government officers and the local groups supported by the CHARM project. Consequently, the fishing capacity in project areas, particularly Phang-nga Bay, has been controlled more effectively.

Thailand has promoted CBFM by not only implementing pilot projects mentioned above, but also conducting training projects for capacity building, for instance, a 2007 training project on Promotion of Community-based Fishery Resources Management by

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[254] Phang-nga Bay was selected as this area hasan area having important protection interest because there are several national parks and wildlife sanctuaries in the area. See, ibid.

[255] Ibid.

[256] Ibid 3.

[257] CHARM, above n 252, 43.

[258] CHARM, above n 253, 9.

[259] Ibid 7.

coastal small-scale fishers.[260] The project was financially supported by the Ministry of Agriculture, Forestry and Fisheries, Government of Japan to the International Cooperative Alliance (ICA)[261] and implemented by the International Cooperative Fisheries Organisation (ICFO).[262] The project aimed to promote 'community-based fisheries resource management by small-scale fishers, who have greatly involved in coastal fisheries and by relevant organisations (i.e., fisheries cooperatives), strengthen their activities, and assist contribute to ensuring sustainable production, creation of employment opportunities and poverty alleviation.' This project consisted of three stages: (i) dispatch of experts to Thailand;[263] (ii) study visit on fisheries resource management in Japan;[264] and (iii) terminal project seminar in Thailand, namely the 'Promotion of Community-based Fisheries Resource Management by Coastal Small-

[260] This project was implemented in selected Asian country every year during 2006-2010. Thailand was chosen to be a project site in 2007.

[261] ICA is an organisation that 'helps individuals, government authorities and regional and international institutions understand the co-operative model of enterprise. It channels specific information to institutions and the media showing the importance of co-operatives to a wide range of economic and social issues.' It is based in Geneva, Switzerland. See, International Co-operative Alliance, *Basics* <http://ica.coop/en/what-we-do>.

[262] ICFO is 'a sectoral organisation of the International Co-operative Alliance. It exists to safeguard the interests of its member organisations, to pursue research into the latest developments in the agricultural co-operative movement, to promote mutual understanding and economic collaboration between the agricultural co-operatives on the one hand and the farmer and other types of co-operatives (e.g., consumers', fisheries, insurance, housing, etc.) on the other, both worldwide and at local level.' This organisation is located in Tokyo, Japan. ICFO selected one country from Asia every year to implement this training project. See, International Co-operative Alliance, *ICA Sectoral Organisations: International Co-operative Agricultural Organisation (ICAO)* <http://ica.coop/en/ica-sectoral-organisations>.

[263] During 16-24 July 2007, the experts came to study the status of current fisheries resource management in Thailand by having meetings with staffs of partner organisations, such as the Cooperative League of Thailand, staffs of the applicable Ministries/Departments (e.g., the Department of Fisheries, the Cooperative Promotion Department), institutes (e.g., Kasetsart University), fishers, fisheries organisations, and NGOs. The experts also had a study trip in many provinces, including Bangkok, Samutsakorn, Samutsongkram, Prachuapkirikhan, Suratthani and Phuket. See, Yugraj Singh Yadava, 'Training Project for Promotion of Community-based Fishery Resource Management by Coastal Small-scale Fishers in Thailand, Report of Phase One (16-24 July 2007) International Cooperative Fisheries Organisation of the International Cooperative Alliance & the Cooperative League of Thailand' (Bay of Bengal Programme, Inter-Governmental Organisation, 2007).

[264] Nine participants who were representatives of the Department of Fisheries, the Cooperative Promotion Department, the Cooperative League of Thailand, Fisheries and Aquaculture Cooperatives and Fish Marketing Organisation, had fieldtrips during 15-29 September 2007 in Tokyo, Hokkaido, Sapporo, Notsuke and Shibetsu. They visited fish markets, fish landing centres and institutes, as well as had meetings and discussions concerning CBFM with staffs of the central government, the prefecture government and FCAs. These field trips aimed to help participants understand the framework of CBFM, co-management and FCAs in Japan, and then would be able to form a policy framework and programs with regard to fisheries resources management in Thailand based on the understanding gained, as well as strengthen and empower fisheries cooperatives in Thailand. See, Yugraj Singh Yadava, 'Training Project for Promotion of Community-based Fishery Resource Management by Coastal Small-scale Fishers in Thailand, Report of Phase Two (15-29 September 2007) International Cooperative Fisheries Organisation of the International Cooperative Alliance & the Cooperative League of Thailand' (Bay of Bengal Programme, Inter-Governmental Organisation, 2007).

scale Fishers in Thailand'.[265] At this seminar, participants have unanimously adopted the "Bangkok Resolutions",[266] which is a set of recommendations obtained from the group discussions.[267] These resolutions are expected to support the co-management and CBFM in marine fisheries sector of Thailand. For instance, the resolutions urge the government to enhance the participation of people in natural resource management; to implement coastal zone management plans; to replace open access fisheries with regulated open access fisheries and later right-based fisheries; to collaborate with coastal communities to effectively conduct MCS in coastal marine waters; and to create chances and enabling environment that support fishers and their cooperatives to participate in all stages of resource management, including the initiation, preparation and implementation stages. Generally, this training project achieved its objectives to promote the CBFM among small-scale fishers in Thailand. It also affirmed that Thailand needs to improve legal environment to support the implementation of the co-management and the CBRF schemes.[268]

Based on the discussions abovementioned, the two fundamental elements required for the CBFM are the legislative framework and the fisheries associations and/or organisations. The law will grant the property right over resources to a community via its association or organisation, e.g., fisheries cooperatives. Therefore, strengthening the fisheries co-operatives within the community should be considered when implementing CBFM. To address these issues, the Master Plan has conducted the project aimed to support the issue of new regulations, which harmonise the new Fisheries Act in terms of

[265] The seminar was aimed to provide capacity building in terms of promoting community-based fisheries resource management to fisheries cooperative leaders and strengthen their connections with concerned government staffs and other stakeholders. The seminar was held in Bangkok during 24-26 February 2008 and attended by 59 people, representing from the concerned Ministries/Departments, academic bodies, fisheries and aquaculture cooperatives, advisors of the project from Japan and BOBP, and observers. See, Yugraj Singh Yadava, 'Training Project for Promotion of Community-based Fishery Resource Management by Coastal Small-scale Fishers in Thailand, Report of Phase Three (22-27 February 2008) International Cooperative Fisheries Organisation of the International Cooperative Alliance & the Cooperative League of Thailand' (Bay of Bengal Programme, Inter-Governmental Organisation, 2008) iii.

[266] See, ibid 21.

[267] "The Bangkok Resolution" (adopted on 26 February 2008) was finalized based on the results of the four group discussions on: '(i) Policy and Legal Support to Coastal Resources Management (CRM); (ii) Sustainable Use of Coastal Resources and their Management; (iii) Institutions and their Role in CRM; and (iv) Livelihoods, Security Nets and Human Resources Development in CRM.' See, ibid 11.

[268] It strongly suggested Thailand to reform the *Fisheries Act B.E. 2490 (1947)* and enact fishery cooperative law to empower fishery cooperatives in fisheries resource management and conservation. The right-based fisheries management also needs to be widely promoted. The Department of Fisheries and the Cooperatives Promotion Department are therefore needed to enhance necessary skills and capacities of the small-scale fishers and communities Yadava, above n 265, 73.

supporting active participations of fisheries communities in marine fisheries management.[269] The Master Plan has also adopted the projects that develop fisheries organisations and communities for coastal resources management,[270] set up the regulations and areas for fisheries management in communities,[271] as well as develop capacity building of concerned sectors (e.g., government offices, fishers, fisheries communities) in terms of marine resources conservation and management.[272] Especially, the Department of Fisheries has conducted the project to promote the prototype of marine fishing community management in all coastal provinces of Thailand since 2007.[273]

In sum, it is clearly seen that in the past decades Thailand has attempted to introduce and implement the co-management and the CBFM schemes through pilot projects and trainings, aiming to better manage coastal fisheries resources and fishing capacity. Nonetheless, based on the lessons gained from these projects, they all suggested that Thailand has lacked the necessary legal and institutional frameworks. In this sense, the Fisheries Act B.E. 2558 (2015) recently enacted could be a legal tool to tackle these issues. Supportive legal and institutional arrangements, however, would still be required.

5.2.7 Taxes

Using taxes is a tradition way that economists tend to apply to counter undesirable incentive in society.[274] The significant advantage in economist's viewpoint in using taxes is when the tax rate has been applied, the resource users themselves will decide about how much they will produce, instead of being centralised to the regulatory agency.[275] Theoretically, using taxes in fisheries is simple, that the authority should impose taxes on fish landings, or efforts, at the level that perceives the bionomic

[269] *The Master Plan*, strategy 1, measure 1, project 1.

[270] *The Master Plan*, strategy 2, measure 3, project 1.

[271] *The Master Plan*, strategy 2, measure 3, project 2.

[272] *The Master Plan*, strategy 2, measure 5.

[273] Detailed of this particular project is greatly discussed under Section 5.2.2.

[274] Greboval and Munro, above n 1, 28.

[275] Milner-Gulland and Mace, above n 2, 151.

equilibrium for the vessels.[276] On other words, the government claims the ownership of the resources and charges the users accordingly. By imposing the appropriate tax rate, the government can, in principle, control the fisheries to operate in the sustainable manner since the economic incentive for overfishing by the fishers will be reduced.[277] For example, taxing on capital could be imposed as a yearly lump sum taxation of a vessel's insurance value, then capital taxation would encourage the vessels having low capacity utilisation (e.g., fishing days) and less profitable to leave the fisheries,[278] as well as reduce the problem of capital stuffing.[279] Therefore, many economists have believed that the introduction of tax measures in fisheries can achieve the management goals more economically than other approaches.[280] In contrary, using tax will increase the total costs of fishing from fishers' viewpoint. Society's viewpoint considers taxes as transfers though.[281] Taxing landings and efforts are theoretically equivalent but in practice it is generally easier to tax the landings.[282] There are some existing options for taxing landings or catches, such as taxing at the point of landing, at some point in the processing chian or at the point of export.[283]

Nonetheless, to control excess capacity in fisheries through taxes has been objected easily at the domestic level because of many reasons. Firstly, in order to advise an optimal tax system it needs to have a big set of economic data, which is generally not available.[284] Furthermore, defining an optimal tax rate applied to a fishery at a particular time is quite complicated. It is due to the fact that the level of fishing capacity depends upon many factors, such as the fish abundance, the fish price when landing,[285] and the

[276] Clark, above n 22, 1-2; Greboval and Munro, above n 1, 28.

[277] Clark, above n 22, 9.

[278] Carsten Lynge Jensen, 'Reduction of the Fishing Capacity in "Common Pool" Fisheries' (2002) 26(3) *Marine Policy* 155, 156.

[279] Ibid 157.

[280] John R Beddington and R Bruce Rettig, *Approaches to the Regulation of Fishing Effort* (FAO, 1984) 19.

[281] Inma Astorkiza et al, 'Financial Instruments' in Lorenzo Motos and Douglas Clyde Wilson (eds), *The Knowledge Base for Fisheries Management* (ELSEVIER, 2006) 109, 110.

[282] Cunningham and Greboval, above n 195, 29.

[283] However, it is important to assure that such export taxes will be used to enhance conservation and economically rational exploit the resources. See, ibid.

[284] Ibid 30.

[285] It is also called "ex-vessel price".

unit cost of fishing effort at a particular time.[286] These factors also fluctuate. To optimally control capacity by taxing, it, therefore, needs to be adjusted accordingly on a regular basis.[287] However, if the fact that taxes will never be optimal and need to be revised on a trial-and-error basis in order to achieve the satisfying level is accepted, this objection can possibly be overcome.[288]

The second objection, which is more serious in practice, concerns political acceptability.[289] In fisheries with overcapacity problem, fishing industry is often in poor economic society, so that government may find it difficult to implement taxation.[290] Government authorities, particularly in Asian countries, would prefer to have reliable information on catch production for the purpose of better fisheries management, rather than a poor tax system.[291] Besides, the attempts to impose taxes on fish landings would result in the protests amongst small scale fishers and general consumers who expected the taxes to be passed on in a form of higher prices of fish products.[292] Unsurprisingly, the tax system is deemed to be politically unacceptable and the fishers would never tolerate it.

In addition, using taxes as a major approach to regulate fishing capacity is not often attempted by fishery managers[293] because taxes are usually imposed for other reasons, and administered by other government agencies.[294] Furthermore, if taxing landings in different rates based on species, it can be costly in terms of enforcement since species identification must be checked to ensure that the sales records are correct. Besides, taxes give a strong incentive to fishers to misreport the landings, particularly when the tax is perceived as unfair by them.[295] In case there are many landing sites, or having fish

[286] Ward and Metzner, above n 4, 77.

[287] Ibid.

[288] Cunningham and Greboval, above n 195, 30.

[289] Ibid.

[290] Ibid 29.

[291] FAO, 'Report of the FAO Technical Working Group on the Management of Fishing Capacity. La Jolla, United States of America, 15-18 April 1998' (FAO Fisheries Report. No. 586, FAO, 1998) <http://www.fao.org/DOCREP/006/X0488E/X0488E00.HTM>.

[292] Ibid.

[293] Clark, above n 22, 3.

[294] Beddington and Rettig, above n 280, 19.

[295] Milner-Gulland and Mace, above n 2, 151.

processed on fishing vessels, or transferring fish between vessels to vessel at sea, enforcement can also be problematic.[296]

However, there is no definite reason why taxation could not be used to mitigate overcapacity. Although short term variations in tax rates might not be broadly useful in practice,[297] this system could be an alternative measure to control capacity, particularly in places where ITQs are simply not feasible (e.g., multi-fisheries).[298] For example, African States legally apply taxation to national fishing companies for rent extraction. This system may not show a significant outcome in terms of reducing incentives of fleet growth, but it is increasingly used for a management purpose of fishing license limitation.[299] Cephalopod fisheries in Mauritania can be one of good examples as imposing export taxes on these fisheries could holdback capacity growth.[300] Furthermore, such tax was gone back to improve infrastructure and organisations of small-scale producers. This arrangement substantially contributed to the quality enhancement of small-scale fishery products, and thus the livelihoods of the small-scale fishers in Mauritania.[301]

Taxation has been commonly applied to foreign vessels seeking access to national EEZ of developing States. Originally, taxation was taken as government incomes, that the access rights were established based on geopolitical consideration.[302] Presently, many of those States have also developed their own fleets, through joint-venture agreements at the beginning stage, and later as fully-owned national companies. As a consequence, taxation with a high tax rate has continued to be applied to foreign vessels for limiting their entry into national waters.[303]

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[296] Beddington and Rettig, above n 280, 20.

[297] Ibid.

[298] Greboval and Munro, above n 1, 29.

[299] Ibid 31.

[300] FAO, above n 291.

[301] Agriculture and Rural Development Department of the World Bank, 'Saving Fish and Fishers: Toward Sustainable and Equitable Governance of the Global Fishing Sector' (Report No. 29090-GLB, May 2004) <http://siteresources.worldbank.org/INTARD/Resources/SavingFishandFishers.pdf> 72.

[302] Greboval and Munro, above n 1, 30-1.

[303] Ibid.

Further, the incentives of most fishing vessels operating on the high seas are financially motivated. Thus, imposing taxes could theoretically reduce activities of such vessels, which eventually reducing fishing capacity on the high seas.[304] In this sense, taxes could be applied on both 'upstream', such as goods and services needed by high sea fisheries and 'downstream', such as fish and fish products obtained from such fisheries.[305]

Royalties can provide a similar effect as taxes in terms of reducing fishing capacity.[306] A fee paid per fish weight of landed fish or on quota shares will apparently decrease the ex-vessel price obtained by fishers and then will decrease the growth rate of fishing capacity. Some States, such as the United States and New Zealand have implemented this method.[307]

In sum, although imposing taxes might not create a large effect on fishing effort in short term but it will provide a significant long-term effect.[308] Thus, fisheries authorities may consider using taxes as an alternate measure to control fishing capacity.

5.2.8 Taxes Scheme in Thailand's Context

Fees and taxes are applied in many ways in Thai fisheries. For examples, fees are imposed on vessel regulations, gear licenses,[309] and fish landed at fishing ports. Taxes are also imposed on fishers or fishing companies based on the level of their incomes (i.e., income tax). Originally, fees and taxes have been imposed in Thai fisheries as a source of revenue to offset administrative and enforcement costs, as well as to support the activities for product marketing. However, such initial purposes are less significant due to the small value of such fees and taxes for present economy, particularly fees and taxes imposed on small-scale fisheries which are the majority of Thai fisheries.[310] Thus, to increase these rates would be unfavourable and could easily be problematic in Thai

[304] Rebecca Metzner, 'Fishing Aspirations and Fishing Capacity: Two Key Management Issues' (2005) 20(3-4) *The International Journal of Marine and Coastal Law* 459, 461.

[305] Ibid.

[306] FAO, *Fisheries Management: 3. Managing Fishing Capacity* (FAO, 2008) 101.

[307] Ward and Metzner, above n 4, 77.

[308] van der Burg, above n 96, 49.

[309] Details are discussed in Chapter 2, Section 2.5.

[310] The new Fisheries Act has already adjusted the fee rates, but these new fees are still low, particularly fees on small-scale fisheries. It is mainly because small-scale fishers are considered poor.

fisheries. Due to this reason, taxation has never been imposed in Thai fisheries for the purpose of fishing capacity controls. However, if socio-economic information of all groups in Thai fisheries is taken into consideration very carefully, using fees or taxes system as a supplementary tool to control fishing capacity could be possible.

5.2.9 Subsidies

It has been found that even in the fisheries that are successfully managed from a biological standpoint, fishers often earn minimal incomes, particularly small-scale fishers who have limited opportunities of alternative incomes. To address this issue, governments have often provided the subsidies to support fishing industry.[311] The subsidies, which impact on fishing capacity the most, are those supporting the construction, acquirement and modification of fishing vessels, and those contributing in operating cost reduction.[312] Subsidies include fishing gears provided, vessel construction assistance, low interest loans, price supports, seasonal unemployment benefits,[313] subsidised fuel and so on. They can also take many forms including 'budgeted grants, subsidised lending, tax and fiscal preferences'.[314] For present fisheries, subsidised lending and tax preferences are likely more important than budgeted subsidies.[315]

A vessel and license buyback program is a form of fisheries subsidies that has been adopted more as a management tool to eliminate excess capacity worldwide, such as in the European Community, the United States, Canada, Norway, Australia, Japan, and Taiwan.[316] However, as discussed in great details under Section 4.3.1.1.1 of Chapter 4, the issues of the renewed incentives for capacity expansion and capital stuffing after the implementation of the buyback program[317] need to be carefully considered. To achieve sustainable capacity reduction, the appropriate design of buyback program for a given fishery is therefore essential.

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[311] Clark, above n 22, 20-1.

[312] Cunningham and Greboval, above n 195, 20.

[313] Clark, above n 22, 21.

[314] Cunningham and Greboval, above n 195, 21.

[315] Ibid.

[316] Ward and Metzner, above n 4, 75.

[317] Clark, above n 22, 3.

Based on the fact that harmful fisheries subsidies contributing to heavy fishing effort that leads to fish stocks depletion worldwide,[318] to address this issue the WTO Members are obliged to propose their notifications of subsidies to the WTO for review every year.[319] Such subsidies include those defined under Article 1(1.1) of the Agreement on Subsidies and Countervailing Measures (ASCM) as shown below:

> '1.1 For the purpose of this Agreement, a subsidy shall be deemed to exist if:
> (a)(1) there is a financial contribution by a government or any public body within the territory of a Member (referred to in this Agreement as "agreement"), i.e., where:
>
> (i) a government practice involves a direct transfer of funds (e.g., grants, loans, and equity infusion), potential direct transfer of funds or liabilities (e.g., loan guarantees);
>
> (ii) government revenue that is otherwise due is foregone or not collected (e.g., fiscal incentives such as tax credits);
>
> (iii) a government provides goods or services other than general infrastructure, or purchase goods;
>
> (iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments; or
>
> (a)(2) there is any form of income or price support in the sense of Article XVI of GATT 1994;[320] and
>
> (b) a benefit is thereby conferred.'

Nonetheless, only about one half of the WTO Members have reported their subsidies to the WTO. This clearly weakens the effectiveness of the ASCM. The under-reporting

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[318] The United Nations General Assembly Resolution 62/177 in 2008 deplored the fact that fish stocks in many parts of the world are overfished or subject to sparsely regulated and heavy fishing efforts, as a result of, inter alia, IUU fishing, inadequate flag State control and enforcement, including MCS measures, inadequate regulatory measures, harmful fisheries subsidies and overcapacity. See, 62/177 Resolution Adopted by the General Assembly: Sustainable Fisheries, Including Through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and Related Instruments 2.

[319] *The Agreement on Subsidies and Countervailing Measures* art 25.

[320] *The General Agreement on Tariffs and Trade 1994* art XVI. It provides that 'Section A - Subsidies in General: 1. If any contracting party grants or maintains any subsidy, including any form of income or price support, which operates directly or indirectly to increase exports of any product from, or to reduce imports of any product into, its territory, it shall notify the contracting parties in writing of the extent and nature of the subsidization, of the estimated effect of the subsidization on the quantity of the affected product or products imported into or exported from its territory and of the circumstances making the subsidization necessary. In any case in which it is determined that serious prejudice to the interests of any other contracting party is caused or threatened by any such subsidization, the contracting party granting the subsidy shall, upon request, discuss with the other contracting party or parties concerned, or with the contracting parties, the possibility of limiting the subsidization.'…

States blame that there is the workload in notifying all specific subsidies.[321] To tackle this difficulty, the Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD) has created a template for notifying subsidies to the WTO in order to standardize the format of the notifications from the WTO Members, as well as to facilitate the WTO Members in notifying such information to the WTO.[322] But, to enhance transparency and decrease the task of notifying subsidies may create the fear of self-incrimination.[323] This could be the reason of increasing per cent of members who did not make any notification in the past decade.[324] Therefore, it is likely that the system of subsidy notification needs to be further improved. Thailand, however, has submitted notifications under Article 25.12[325] and 32.6[326] of the SCM Agreement.[327]

The subsidy programs of fishing industry, for distant water fishing nations (DWFNs) in particular, can be used as a tool to eliminate or mitigate the fishers' tendencies towards overexploitation and overcapitalisation in their national waters. Where resource managers have faced the problem of gross overexploitation by fleets in national waters, it could be less costly for the authorities (both in terms of political and economic aspects) to encourage those fleets, through subsidy programs, to operate outside the national waters.[328] However, it is critical to ensure that such fishing capacity will not generate overcapacity problem in the new fishing grounds.

In conclusion, although the effect of subsidies in fisheries can easily be predicted that they might lead to higher effort levels and greater depletion of fish stocks, subsidies

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[321] Michael Thone and Stephan Dobroschke, *WTO Subsidy Notifications: Assessing German Subsidies under the GSI Notification Template Proposed for the WTO* (International Institute for Sustainable Development, 2008) 1.

[322] Ibid.

[323] Ibid 24.

[324] The per cent of the WTO members who did not make any notification has increased from 46 per cent in 2001 to 53 per cent in 2011. See, ibid 4.

[325] *The WTO Agreement on Subsidies and Countervailing Measures* art 25.12. It provides that 'Each Member shall notify the Committee *(a)* which of its authorities are competent to initiate and conduct investigations referred to in Article 11 and *(b)* its domestic procedures governing the initiation and conduct of such investigations.'

[326] *The WTO Agreement on Subsidies and Countervailing Measures* art 32.6. It provides that 'Each Member shall inform the Committee of any changes in its laws and regulations relevant to this Agreement and in the administration of such laws and regulations.'

[327] The per cent of the WTO members that did not make any notification has increased from 46 per cent in 2001 to 53 per cent in 2011. See, Thone and Dobroschke, above n 321, 34.

[328] Greboval and Munro, above n 1, 18.

may not automatically generate situations of overcapacity,[329] particularly when subsidies are properly designed to urge fishers to permanently leave the industry rather than to stay and increase the fishing effort. Combining subsidies with taxes could also decrease the renewed incentives generated from the common-property characteristic of fisheries stocks.[330]

5.2.10 Subsidies Scheme in Thailand's Context

Thailand has provided subsidies to marine fisheries sector in several forms, including fishing gears supplied, vessel construction assistance, infrastructure provided, price supports, subsidized fuel and vessel buyback. But, as the fisheries subsidy in terms of buyback programs are already discussed in great details under Section 4.3.1.1.1 of Chapter 4,[331] this section will therefore focus on other types of subsidies, particularly subsidized fuel, which is also the main fisheries subsidy given by the Thai government.

As the cost of fuel is the substantial component of the operational costs of fishing vessels, the fuel crisis happened worldwide since 2001 has caused many Thai fishers to stop fishing and lose their subsistence income, particularly small-scale fishers who normally have to buy expensive fuel sold in their rural communities.[332] They therefore sought help from the government. The Thai government by the Department of Fisheries has then taken the controversial step[333] by establishing the two projects of subsidized fuel for fishing vessels, i.e., the Green Fuel Program and the Purple Fuel Program. The Green Fuel Program supplied tax free fuel for commercial fishing vessels. There were approximately 1,000 fishing vessels participating in this program with over 1,700 million litres of fuel supplied per year. On the contrary, the Purple Fuel Program supplied a special type of fuel (containing lower sulphur dioxide) that is suitable for

[329] Cunningham and Greboval, above n 195, 20.

[330] Milner-Gulland and Mace, above n 2, 155.

[331] They are buyback programs for the main purpose of push net reduction in Thai fisheries.

[332] The cost of fuel accounts more than 50 per cent of operational cost of small-scale fishing vessels. See, Sampan Panjarat, 'Sustainable Fisheries in the Andaman Sea Coast of Thailand' (Division of Ocean Affair and the Law of the Sea, Office of Legal Affairs, the United Nations, 2008) 38.

[333] Theo Ebbers and Rick Gregory, 'Capacity Development for Improving the Knowledge Base for Fisheries Management in Southeast Asia - a Regional Initiative, Implemented Locally' (APFIC Ad Hoc Publication, FAO Regional Office for Asia and the Pacific, 2009) <http://www.apfic.org/uploads/wfd_124079351849f50185b51a1--capacity.pdf> 42.

vessel engines to small-scale fishing vessels with lower price than market price.[334] Undoubtedly, although this arrangement could lessen the problem of fuel crisis in fisheries, it also raised a question whether this could also be considered as a support to maintain the overcapacity problem in Thailand.

To address the fuel issue more environmental friendly and economically, the Thai government has conducted a pilot project to promote using sails with fibre-glass vessels for small-scale fishing (e.g., gill net fishing) in 2007. This project was financially supported by the Chaipattana Foundation[335] and initially aimed to assist small-scale fishers in the Andaman coast of Thailand who have suffered from the fuel crisis and the Tsunami attacked in 2004. The project result suggested that using sails for only one way of fishing trip could significantly save the cost of fuel for small-scale fishing vessels, and then it would be worth investing in long term.[336] Based on this successful outcome, using sails for small-scale fishing have been promoted along the coasts of Thailand by not only government agencies but also the regional fisheries body, i.e., SEAFDEC.[337] The promotion of wind energy to propel small-scale fishing vessels could therefore be

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[334] Panjarat, above n 332, 43.

[335] The Chaipattana Foundation has been registered on 14 June 1988 with an initiative of establishment of His Majesty King Bhumibol Adulyadej. He also appointed Her Royal Highness Princess Maha Chakri Sirindhorn to be the Executive Chairperson. This non-political foundation promotes His Majesty the King's principle of sustainable development, focusing on the development work on farmers and their livelihoods. The foundation aims to improve the farmers' social welfare and capacity to become self-reliant, and therefore projects that will yield long-term resulted are invested by the foundation. However, such development work will not repeat the work that has been conducted by government organisations, it rather provides assistance and facilities for the development of country. See, The Chaipattana Foundation, *The History of Chaipattana Foundation* (2013) <http://www.chaipat.or.th/chaipat_english/index.php?option=com_content&view=article&id=4068&Itemid=286>; The Chaipattana Foundation, *Missions and Operating Principles* (2013) <http://www.chaipat.or.th/chaipat_english/index.php?option=com_content&view=article&id=4120&Itemid=295>; The Chaipattana Foundation, *Our Approach* <http://www.chaipat.or.th/chaipat_english/index.php?option=com_content&view=article&id=4106&Itemid=285>.

[336] Small-scale fishing vessels (e.g., outboard-engine or long-tail boat with 10-13 horse power of engine) generally spend 1-2 hours for travelling to fishing ground and averagely use three litres of fuel per hour. As at 4th April 2013, diesel fuel costs about THB30 (USD1) per litre. See, Thai Bangjak, 'กรมประมงประสบความสำเร็จในโครงการเรือใบเพื่อการประมง เตรียมขยายผลส่งเสริมสนับสนุนอย่างกว้างขวาง [Department of Fisheries Succeeds on the Project of Using Sails for Fishing and Plans to Broadly Promote it]', *Daily News* (Bangkok), 2007 <http://www.nicaonline.com/webboard/index.php?topic=7299.0;wap2>.

[337] Under the Project on Responsible Fishing Technologies and Practices (Fishing in harmony with the nature), SEAFDEC has conducted activities to promote an alternative of energy sources for coastal fisheries in ASEAN countries, in collaboration with applicable SEAFDEC Member Countries. The activities under this project consist of experiments and trials on using sails for small-scale fishing vessels. The promotion of wind energy to propel small-scale fishing vessels was also included in training courses that were organised in Myanmar and Thailand. See, SEAFDEC, 'SEAFDEC Future Project on Energy Use in Fisheries in Southeast Asia', *Advance Fisheries Technology* (Bangkok), Jan-Apr 2011.

an alternative way to provide fishers the subsidy, which is not harmful to environment and the state of fishing capacity in Thailand.

In addition to subsidies provided to domestic fisheries, the Thai government has provided subsidies for distant water fisheries (i.e., fisheries operated in other State EEZs and the high seas) in order to encourage and support fishers to leave domestic fisheries, which will consequently alleviate overcapacity problem in Thai waters. To tackle this issue more explicitly, the Department of Fisheries has adopted the strategy on 'Promotion and Development of Distant Water Fisheries' under the Master Plan.[338] Under this strategy, a number of projects have been carrying out with objectives, for instance, to establish a joint public-private sector committee on distant water fishing development;[339] to establish distant water fisheries development fund; to promote and support fishing cooperation with foreign countries; to promote and strengthen the sea worthiness and fishing capability of Thai distant water fishing operations; and to support activities of regional fisheries management organisations and other relevant agencies. Importantly, there are the projects concerning the change of using trawl nets to alternate fishing gears that are internationally accepted as less destructive fishing gears, such as vertical long lines and traps, as well as converting trawlers to tuna long line vessels for high seas fisheries.[340]

It is clearly seen that Thailand has greatly subsidised marine fisheries sector for a long time. However, these establishments, particularly in terms of subsidised fuel and buyback programs for push netters, have unlikely tackled overcapacity problem in Thai fisheries. More effective approaches, such as a buyback program with appropriate design for the nature of Thai fisheries, need to be seriously considered. The projects to subsidise distant water fisheries for Thai fishers also need to be supported continuously.

[338] *The Master Plan*, strategy 5.

[339] The committee will facilitate joint venture negotiation with coastal countries and safeguard Thai interest.

[340] *The Master Plan*, strategy 5, measure 2, project 6-7.

5.3 Conclusion

This chapter discussed about incentive adjusting measures that are significantly implemented to control fishing capacity in present fisheries. These measures are designed to either generate property rights over fisheries resources for fishers (i.e., individual harvest quotas, TURFS, co-management and CBFM) or adjust economic incentives in fisheries (i.e., taxes, subsidies). However, it was found that although the implementation of these measures results in adjusting incentives of capacity expansion of fishers, its effectiveness might vary in different circumstances. For favourable outcome in capacity control, the combination of measures might need to be considered. Furthermore, the effectiveness of particular measure greatly depends upon a number of factors, including appropriate legal and institutional environments of given fisheries. In case of Thailand, it has implemented incentive adjusting measures (except individual harvest quotas) and likely obtained the positive outcome from TURFs, co-management and CBFM projects, which aim to provide fishers the property rights over fisheries resources. Thailand, however, still needs the legislative framework to support such implementation, particularly in terms of enforcement at local level, in order to achieve the sustainable success on capacity controls. For the implementation of tax and subsidies (on fuel in particular), they have unlikely provided any positive effect on capacity controls for Thailand.

CHAPTER 6 SUPPLEMENTARY MANAGEMENT MEASURES FOR FISHING CAPACITY AND IMPLEMENTATION BY THAILAND

6.1 Introduction

In addition to the measures for fishing capacity management that can change the incentives of fishers, i.e., incentive blocking measures and incentive adjusting measures, there are some supplementary measures that can also be applied to control fishing capacity in the indirect way. This chapter discusses such some supplementary measures, which include ecosystem-based fishery and multispecies fisheries management, and closed seasons and closed areas. The implementation of these measures by Thailand is analysed as well.

6.2 Supplementary Management Measures

Although some fishery management measures are implemented mainly to conserve marine resources and/or marine ecosystem, they additionally provide the effect of capacity controls. Such notable measures include ecosystem-based fishery and multispecies fisheries management, and closed seasons and closed areas measures. The former two measures have been increasingly used in modern fisheries, whereas the latter ones have been widely applied worldwide for decades. Details of these measures are discussed as follows.

6.2.1 Ecosystem-based Fishery and Multispecies Fisheries Management

Presently, fisheries management has growingly concerned on environment and biodiversity as there are progressive evidences of the negative impacts of fishing on not only fisheries resources but also marine ecosystems.[1] The evolution of ecosystem-related provisions within the international instruments, particularly the *1982 UN Fish Stocks Agreement* and the *CCRF*, has affirmed this trend. The *Fish Stocks Agreement* imposes obligations on member States to safeguard marine environment and biodiversity, as well as requires States to implement measures to ensure the

[1] Michael Sinclair et al, 'Responsible Fisheries in the Marine Ecosystem' (2002) 58(3) *Fisheries Research* 255, 256.

sustainability of fish stocks in long term by promoting the optimum use of such fish stocks. States are further required to adopt the precautionary approach and take necessary measures to conserve or restore other species belonging to the same ecosystem.[2] Similarly, the *CCRF* urges States to adopt the precautionary approach for conservation, exploitation and management of living resources and preserve the aquatic environment.[3]

Concurrently, the management of ecosystem has begun to take social and economic aspects into consideration. It is based on the fact that humans are accepted as an important component of the ecosystem, thus humans' basic requirements (i.e., human welfare)[4] are unavoidable for sustainability and conservation.[5] Ecosystem-based fishery and multispecies fisheries management are therefore progressively adopted as fishery management tools.[6]

Ecosystem-based fishery management (EBFM) is introduced as an alternative management approach that gives management priorities to rather ecosystem[7] than target species of fishing.[8] EBFM is different from ecosystem-based management (EBM) as EBM is applied to manage cross-sectors in a broader context, whereas the EBFM is applied to manage more on fishery sector.[9] The definition of EBFM varies. The US National Research Council defines it as 'an approach that takes major ecosystem

[2] *Fish Stocks Agreement* art 5.

[3] *CCRF* art 7.5.1.

[4] United Nations Environment Programme, 'Green Economy in a Blue World' (2012) <http://www.unep.org/pdf/green_economy_blue.pdf> 23.

[5] FAO, *The Ecosystem Approach to Fisheries: Issues, Terminology, Principles, Institutional Foundations, Implementation and Outlook* (Rome, 2003) 48.

[6] At present, EBFM is a common topic in the discussions on fisheries policy and management. See, Richard J Marasco et al, 'Ecosystem-based Fisheries Management: Some Practical Suggestions' (2007) 64(6) (June) *Canadian Journal of Fisheries and Aquatic Sciences* 928, 929.

[7] An ecosystem refers to 'a biological environment comprising all living organisms or biotic components, in a certain area, and the nonliving, or abiotic components that living organisms interact with, for example, air, soil, water and sunshine.' See, Neil A Campbell et al, *Biology: Concepts & Connections, Sixth Edition* (Benjamin Cummings, 2009). Technically ecosystem cannot be managed, thus fisheries scientists and managers have put the effort to manage fisheries by concerning the importance of ecosystem. See, Jason S Link, 'What Does Ecosystem-based Fisheries Management Mean?' (2002) 27(4) *Fisheries* 18.

[8] Ellen K Pikitch et al, 'Ecosystem-based Fishery Management' (2004) 305(5682) *Science* 346.

[9] Although EBM and EBFM are different, they are complementary. See, Karen L McLeod et al, 'Scientific Consensus Statement on Marine Ecosystem-Based Management. Signed by 217 academic scientists and policy experts with relevant expertise and publish by the Communication Partnership for Science and the Sea' (2005) <http://compassonline.org/?q=EBM> 6.

components and services-both structural and functional-into account in managing fisheries... It values habitat, embraces a multispecies perspective, and is committed to understanding ecosystem processes'.[10] Some scientists, however, define EBFM as 'ecosystem-based fishery management recognizes the physical, biological, economic, and social interactions among the affected components of the ecosystem and attempts to manage fisheries to achieve a stipulated spectrum of social goals, some of which may be in competition'.[11] This new approach has been developed due to the fact that the traditional management approaches focusing on single species or stocks have often failed because of the lack in consideration of other factors that significantly impact marine resources,[12] such as interactions between species, biomass distribution, the modification of structure and/or function of ecosystem, biodiversity, non-target species, and gear impacts on habitat.[13] On other words, actual populations interact with their environment and other species, and therefore may be strongly influences by them. These factors can add the complexity and uncertainty to the fisheries management.[14]

The goals of EBFM are to maintain healthy marine ecosystem by rehabilitating and sustaining species populations and biological environment in marine ecosystem with the purpose of keeping productivity and biological diversity at a high level,[15] at the same time, maintain the sustainability of fisheries.[16] Reducing excessive levels of bycatch and

[10] Fisheries National Research Council Committee on Ecosystem Management for Sustainable Marine, *Sustaining Marine Fisheries* (National Academy Press, 1999) 2. However, the term of EBFM did not meet with consensus at the FAO Technical Consultation on Ecosystem-based Fisheries Management that was organised during 16-19 September 2002 in Reykjavik. It could be because some States perceived ecosystem as a new basis of fisheries management. In this sense, the environmental considerations would be above the social and economic considerations, which creating questions in terms of equity, political and socio-economic costs and the feasibility of implementation. Thus, the term of 'Ecosystem Approach to Fisheries (EAF)' was used instead. See, FAO, above n 5, 6. EAF refers to 'an ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries.' See, FAO, *Fisheries Management: 2. The Ecosystem Approach to Fisheries* (FAO, 2003) 6.

[11] Marasco et al, above n 6, 930.

[12] Lisa T Ballance and Tara Whitty, 'Ecosystem-Based Management for the Oceans' (2010) 18(5) *Restoration Ecology* 780; Pikitch et al, above n 8.

[13] Link, above n 7, 19; Colin W Clark, 'Fisheries Bioeconomics: Why is It so Widely Misunderstood?' (2006) 48(2) *Population Ecology* 95, 98.

[14] Clark, above n 13, 98.

[15] National Research Council Committee on Ecosystem Management for Sustainable Marine, above n 10, 2.

[16] Link, above n 7; Pikitch et al, above n 8.

discards is a goal of EBFM as well.[17] To achieve these goals, the objectives of EBFM should be:[18] to avoid the deterioration of ecosystem; to reduce the risk of permanent damage of natural biological groups of ecosystem; to sustain socioeconomic benefits without ruining ecosystem; and to educate people to understand the impacts of human actions on ecosystem. Local and traditional knowledge often provide unique perspectives used to assess EBFM. Also, legal and political scenarios should be considered before implementing EBFM.[19]

In case the necessary knowledge is inadequate, precautionary fishery management measures should be adopted by simply using history and common knowledge.[20] For instance, precautionary measures can be the implementation of larger closed area and the reduction of catch limits,[21] which technically control fishing capacity. Some levels of precautionary measures are required for EBFM in order to shift the burden of proof. In this sense, destructive fishing practices should not be allowed, so that essential habitat and other key components of ecosystem will be protected.[22] Therefore, ocean zoning with spatial and temporal characteristics is an important element of EBFM,[23] as well as monitoring, research, and modelling are necessary to build successful EBFM.[24] Further, as the complexity and uncertainty limit the extent to which the effects of fishing can be understand or predicted, the risk management strategy should be

[17] At global level, the estimated amount of discards in commercial fisheries is approximately 27.0 million tonnes, which is about one-fourth of the world's marine fish catch. See, Dayton L Alverson, 'Global Assessment of Bycatch and Discards: a Summary Overview' in Ellen K Pikitch, Daniel D Huppert and Michael P Sissenwine (eds), *Global Trends: Fisheries Management (AFS Symposium 20)* (American Fisheries Society Publication, 1997) 115.

[18] Karen McLeod and Heather Leslie (eds), *Ecosystem-Based Management for the Oceans* (Island Press, 2009) 310.

[19] Ibid.

[20] Pikitch et al, above n 8.

[21] Ibid 347.

[22] Keith J Sainsbury et al, 'Experimental Management of an Australian Multispecies Fishery: Examining the Possibility of Trawl-Induced Habitat Modification' in Ellen K Pikitch, Daniel D Huppert and Michael P Sissenwine (eds), *Global Trends: Fisheries Management (AFS Symposium 20)* (American Fisheries Society Publication, 1997) 107; Callum M Roberts et al, 'Effects of Marine Reserves on Adjacent Fisheries' (2001) 294(5548) (30 November) *Science (New York, N.Y.)* 1920.

[23] Pikitch et al, above n 8; David Witherell, Clarence Pautzke and David Fluharty, 'An ecosystem-based approach for Alaska groundfish fisheries' (2000) 57(3) *ICES Journal of Marine Science* 771.

[24] Les Kaufman, Leah Bunce Karrer and Charles H Peterson, 'Monitoring and Evaluation' in Karen McLeod and Heather Leslie (eds), *Ecosystem-based Management for the Oceans* (Island Press, 2009) 115.

applied.[25] Taking these factors into consideration, a marine protected area (MPA) has been suggested as a measure used for required precautionary approach.[26]

MPAs are areas regulated by zoning system that may include marine reserves and areas where a variety of uses are permitted.[27] MPAs are a form of time-area closures but usually found as year-round closures.[28] These marine reserves (e.g., 'no-take' areas) are expected to help control fishing mortality and then minimise the uncertainty and the risk of fisheries collapse[29] by providing safeguard for some or all natural resources within the areas.[30] Also, banning some mobile gears (e.g., trawl gears) in MPAs may reduce the negative impact of these gears on sea-floor habitat and ecosystem.[31] In this sense, MPAs can also assist in controlling fishing capacity of such fishing gears in concerned areas. However, it should be aware that, unless proper controls are also implemented in surrounding areas, MPAs may increase or sustain fishery yields and fishing capacity in such areas.[32] Further, MPAs might not give a desired reference point for resources sustainability in some situations, since both fishing and non-fishing areas in the MPAs could be deteriorated over a period of time because of factors involved when operating at large space.[33] More importantly, MPAs should be established with good monitoring (before and after establishment, within and outside MPAs) and evaluation procedures to

[25] Clark, above n 13, 98.

[26] Ibid; Michael P Sissenwine and Pamela M Mace, 'Governance for Responsible Fisheries: An Ecosystem Approach' (Paper presented at the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, Reykjavik, Iceland, 1-4 October 2001) <ftp://ftp.fao.org/fi/document/reykjavik/pdf/21sissenwine.PDF> 11.

[27] Keith Sainsbury and Ussif R Sumaila, 'Incorporating Ecosystem Objectives into Management of Sustainable Marine Fisheries, including 'Best Practice' Reference Points and Use of Marine Protected Areas' (Paper presented at the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, Reykjavik, Iceland, 1-4 October 2001) <ftp://ftp.fao.org/fi/document/reykjavik/pdf/20Sainsbury.pdf> 3.

[28] Sissenwine and Mace, above n 26, 11.

[29] James A Bohnsack, 'Maintenance and Recovery of Reef Fishery Productivity' in Nicholas V C Polunin and Callum M Roberts (eds), *Reef Fisheries* (Chapman and Hall, 1996) 283.

[30] The South Atlantic Fishery Management Council, *Marine Protected Areas* <http://www.safmc.net/managed-areas/marine-protected-areas>.

[31] Les Watling and Elliott A Norse, 'Disturbance of the Seabed by Mobile Fishing Gear: A Comparison to Forest Clearcutting' (1998) 12(6) *Conservation Biology* 1180; Henrik Gislason et al, 'Symposium Overview: Incorporating Ecosystem Objectives within Fisheries Management' (2000) 57(3) *ICES Journal of Marine Science* 468.

[32] MPAs provide the most benefits in terms of species enhancement when adult stage of such species is relatively sedentary, while their larvae widely spread. See, Sainsbury and Sumaila, above n 27, 13.

[33] Ibid 11.

ensure the achievement of their ecological, economic[34] or social objectives.[35] As these objectives are varying, MPAs, therefore, can be greatly different in terms of type, size and shape.[36] These objectives, however, need to be identified as early as possible[37] and truly concern local characteristics.[38] Active support and involvement of public and local communities are also essential for the success of MPAs,[39] particularly in terms of enforcement at a local level.

There are many examples of MPAs implementation worldwide. For instance, the South Atlantic Fishery Management Council[40] has established eight deepwater MPAs in the South Atlantic areas under the application of Amendment 14 to the Snapper Grouper Fishery Management Plan. These MPAs aim to safeguard some of long-lived snapper grouper species living in deepwater, including snowy grouper, blueline tilefish, and speckled hind.[41] The regulations imposed within these MPAs include: '(i) no catching or possession of any snapper grouper species; (ii) no use of shark bottom longline gear; (iii) vessels (both commercial and recreational types) may transit (direct, non-stop progression) through the MPAs with snapper grouper species on the vessels with fishing gear properly put away; and (iv) trolling for pelagic species, e.g., tuna, mackerel, billfish, and dolphin is permitted within the MPAs'.[42]

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[34] For example, economic benefits can be determined from the increase of non-consumptive benefits, e.g., 'dolphin watch' within the areas of MPAs. See, ibid 13.

[35] In reality, many MPAs have been established without these requirements though. See, ibid.

[36] Nadine Heck, Philip Dearden and Adrian McDonald, 'Stakeholders' Expectations Towards a Proposed Marine Protected Area: A Multi-criteria Analysis of MPA Performance Criteria' (2011) 54(9) *Ocean and Coastal Management* 687, 687.

[37] Ibid.

[38] Ibid.

[39] Ussif R Sumaila et al, 'Addressing Ecosystem Effects of Fishing Using Marine Protected Areas' (2000) 57(3) *ICES Journal of Marine Science* 752; Heck, Dearden and McDonald, above n 36, 687.

[40] The South Atlantic Fishery Management Council has the responsibility to conserve and manage fish stocks within the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia and east Florida to Key West. Under their jurisdiction, MPAs refer to 'a network of specific areas of marine environments reserved and managed for the primary purpose of aiding in the recovery of overfished stocks and to ensure the persistence of healthy fish stocks, fisheries, and associated habitats. Such areas may include naturally occurring or artificial bottom and water column habitats, and may include prohibition of harvest on seasonal or permanent time periods to achieve desired fishery conservation and management goals'. See, The South Atlantic Fishery Management Council, *About Us* <http://www.safmc.net/AboutUs/AboutSAFMC/tabid/361/Default.aspx>.

[41] The South Atlantic Fishery Management Council, above n 30.

[42] Ibid.

Apart from MPAs that are repeatedly suggested as an effective instrument for ecosystem-based fisheries management, other technical tools, such as fish quotas, limitations of fishing effort, gear restrictions, closed areas and closed seasons, could also be applied to address ecosystem concerns.[43] For instance, closed areas could be used to safeguard not only spawning areas and juveniles but also benthic habitat.[44] On the other hand, with some situation that right-based management measures (e.g., ITQs) may not be sufficient to address the problem of resource management, the EBFM plan could be implemented in order to obtain the better outcome. For example, although ITQs was applied on orange roughy fisheries in 1986, their catch continued to decrease due to the problems of overfishing, damaged benthic habitat from trawling practices, particularly bottom trawlers, and prey unavailability.[45] Thus, the EBFM plan, which concerns the changes of trophic level, conditions of environment, and ecological processes, is needed for managing this stock.[46]

Although EBFM must manage target species by considering the overall state of ecosystem indicators,[47] reference points[48] and performance measures obtained from single species approach are still required[49] but will need to be modified in the context of ecosystem.[50] In fact, the single-species approach implicitly or indirectly incorporate some ecosystem features. For example, within single-species assessment models, some properties of ecosystems can be captured by letting the weight of species to change

[43] Sinclair et al, above n 1, 263.

[44] Ibid.

[45] Malcolm Clark, 'Fisheries for Orange Roughy (*Hoplostethus atlanticus*) on Seamounts in New Zealand' (1999) 22(6) *Oceanologica Acta* 593; M R L Jones, 'Historic Trawl Data and Recent Information Infers Temporal Change in the Occurrence of Squid in the Diet of Orange Roughy (*Hoplostethus atlanticus* Collett) in New Zealand' (2007) 17(2) *REVIEWS IN FISH BIOLOGY AND FISHERIES* 493.

[46] Marasco et al, above n 6.

[47] Indicator is something that is measured (not necessarily numerically) and used to track an operation objective. See, Sainsbury and Sumaila, above n 27, 4.

[48] Reference point is a standard value of an indicator, often in connection to the operational objective, e.g., expected targets, undesirable limits or stimulator for specified management reactions. A target reference point can be set as an objective for operation. See, ibid. For the development and evaluation of precautionary management strategies, limit reference points for biological conservation are the most important. See, Andrew A Rosenberg, 'Precautionary Management Reference Points and Management Strategies' in FAO (ed), *Precautionary Approach to Fisheries. Part 2: Scientific Papers. Prepared for the Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introductions). Lysekil, Sweden, 6–13 June 1995*, FAO Fisheries Technical Paper 350/2 (FAO, 1996) 210, 130.

[49] More methodologies are available for single species approach and they are usually much cheaper. See, Link, above n 7, 19-20.

[50] Pikitch et al, above n 8, 347; Sainsbury and Sumaila, above n 27, 3.

according to age over time and by estimating annual recruitments.[51] But, it is essential to note that indicators and biological reference points (e.g., MSY) obtained from single-species based analysis need to be used with careful manner as the sum of MSY of each particular species is usually larger than the MSY for the overall system.[52] Thus, overfishing under the ecosystem plan (or called ecosystem overfishing) possibly exists when it might not be considered overfishing in terms of a single-species stock.[53] Accordingly, the reduction of fishing capacity and mortality might still need to be considered.[54]

Clearly, it is challenging to include ecosystem-related objectives into fisheries management because to identify the influential factors of environment and ecology, such as oceanographic and whether conditions, and to understand their processes and interactions are not easy.[55] Besides, there are a number of issues needed to consider when making decisions on management, and evaluating management performance. Some practical methods are proposed to address these issues, including methods to support: '(i) systematic and transparent selection of issues to address fishery sustainability in an ecosystem context; (ii) quantitative risk-based testing and identification of appropriate sustainability indicators and performance measures for key issues; and (iii) quantitative risk-based testing of the likely performance and level of precaution of management strategies in the context of the whole management system.'[56]

It should be noticed that during the period of changing to EBFM, the management plans might be the same as the plans currently used, such as single-species based management.[57] New management strategies, particularly by using ecosystem models, can be later used when a number of relevant models give consistent results and the evaluation of new management strategies shows good performance.[58] Furthermore, the

[51] Marasco et al, above n 6, 933; Kerim Y Aydin, 'Age Structure or Functional Response? Reconciling the Energetics of Surplus Production Between Single-species Models and ECOSIM' (2004) 26(1) *African Journal of Marine Science* 289.

[52] Link, above n 7, 19-20.

[53] Pikitch et al, above n 8, 347.

[54] Link, above n 7, 20.

[55] Marasco et al, above n 6, 934.

[56] Sainsbury and Sumaila, above n 27, 15.

[57] Marasco et al, above n 6, 934.

[58] Ibid.

transition to EBFM needs to be evolutionary rather than revolutionary.[59] In this sense, some serious problems are needed to be timely solved, i.e., overfishing and excess capacity. Such evolution should involve three stages, including (i) assessments of the state of concerned species and their predators and preys; (ii) evaluation of the environmental effects on target species and fishing activities concerned; and (iii) integrated assessments of the environment conditions, concerned stock and its predators and prey before proper catch limits and other management measures are implemented.[60] In a consequence, **multispecies fisheries management** approach is developed. This new approach will use multispecies models designed by using yield information, and structured by merging the effects of ecological process among involved populations.[61] In other words, this approach moves from using models concerning only single species to models concerning the overall community, which taking food web into consideration.[62]

There is a number of multispecies models developed in the past years, including multispecies production models (MSP),[63] multispecies virtual population analysis (MSVPA),[64] Ecopath with Ecosim (EwE),[65] and multispecies bioenergetics models (MSBE).[66] For example, MSVPA, which has been developed continuously, is an approach to measure the level of interactions between predator and prey, and evaluate the predation mortality rate for exploited fish stocks, whereas an extended MSVPA (MSVPA-X) is an improved version with increased flexibility of model in terms of predator-prey interactions due to seasonal dynamics.[67] MSVPA-X is also more flexible

[59] Ibid.

[60] Daniel Goodman et al, 'Scientific Review of the Harvest Strategy Currently Used in the BSAI and GOA Groundfish Fishery Management Plans' (North Pacific Fishery Management Council, 21 November 2002) <ftp://ftp.afsc.noaa.gov/afsc/public../CIE_Rockfish/docs/GoodmanF40Report.pdf>.

[61] Robert J Latour, Mark J Brush and Christopher F Bonzek, 'Toward Ecosystem-Based Fisheries Management' (2003) 28(9) *Fisheries* 10.

[62] Marasco et al, above n 6, 936.

[63] Latour, Brush and Bonzek, above n 61, 11.

[64] Kjartan G Magnússon, 'An Overview of the Multispecies VPA-Theory and Aapplications' (1995) 5(2) *REVIEWS IN FISH BIOLOGY AND FISHERIES* 195; Robert J Magnus and Kjartan G Magnusson, 'Existence and Uniqueness of Solutions to the Multispecies Virtual Population Analysis Equations' (1987) 4(3) *IMA journal of mathematics applied in medicine and biology* 247; Hans Lassen and Paul Medley, *Virtual Population Analysis - A Practical Manual for Stock Assessment* (FAO, 2000) 19.

[65] Latour, Brush and Bonzek, above n 61, 13.

[66] Ibid 14.

[67] Lance P Garrison et al, 'An Expansion of the MSVPA Approach for Quantifying Predator-prey Interactions in Exploited Fish Communities' (2010) 67(5) *ICES Journal of Marine Science* 856.

in terms of feeding model. The MSVPA-X model has been applied on the fish community in a western Atlantic area, particularly on Atlantic menhaden and its main fish predators.[68]

Some spatial models concerning fish motion and spatial differences in biological parameters are also developed. In this matter, a number of methods, i.e., tagging techniques, genetic markers, and geographic information systems (GIS), are conducted and combined to facilitate spatial based fisheries management.[69] However, they are rarely used in stock assessments due to their complexity.[70]

Before using these models to make either quantitative or qualitative management predictions, model validation is needed. The results generated by the model must be evaluated with independent time series data (such as abundance and biomass), which are not applied in model calibration.[71] Usually, TACs have been determined by using single-species models of population dynamics, which have been criticized that they ignore important features of marine ecosystem. Therefore, if provided data is available,[72] management decisions, particularly in catch limits, should be based on multispecies or ecosystem models.[73] Nonetheless, it is quite challenging in terms of application as existing data is subject to bias and misinterpretation.[74] Also, it should be aware that such models can account only the factors concerned by developers. More importantly, due to the variation of environmental influence on stock recruitment, long-

[68] Ibid.

[69] Marasco et al, above n 6, 931.

[70] Ibid.

[71] Latour, Brush and Bonzek, above n 61. If the model's predictions are in line with the data, it implies that this model is appropriately used. See, Eleanor J Milner-Gulland and Ruth Mace, *Conservation of Biological Resources* (Blackwell Science, 1998) 13. Furthermore, it is now very important to take into account burden of proof. The experimental examples of consumption expressed by non-human predators suggest the sustainable options better than harvest rates obtained from models that ineffectively explain complicated systems. Foe example, MSY rates derived from population dynamic models are often higher than the average of experimental examples of consumption rates amongst non-human species. However, fishery manager might not be able to wait until receiving perfect data before implementing management measures to ensure resources sustainability. Improving required data through researches should therefore be emphasised. See, C W Fowler, 'Management of Multi-species Fisheries: from Overfishing to Sustainability' (1999) 56(6) *ICES Journal of Marine Science* 927, 931.

[72] Latour, Brush and Bonzek, above n 61.

[73] Colin W Clark, *The Worldwide Crisis in Fisheries Economic Models and Human Behavior* (Cambridge University Press, 2006) 26.

[74] Fowler, above n 71, 931.

term predictions from either single-species or multispecies models are still unstable.[75] Additionally, management will often require commercial fisheries to substantially reduce their harvests in order to meet sustainability requirement, which will definitely challenge in all institutional, social, economic and political perspectives.[76]

Some States have adopted the ecosystem-based approach to their national legal framework for ocean management. Australia's Oceans Policy (AOP) is one of the good examples. The AOP, which was issued by the Federal Government of Australia in December 1998, is an attempt to promote and support an integrated and ecosystem-based approach for conservation and management of the ocean.[77] The goals of the AOP are 'to understand and protect Australia's marine biological diversity, the ocean environment and its resources, and ensure ocean uses are ecologically sustainable; to promote ecologically sustainable economic development and job creation; to establish integrated oceans planning and management arrangements.'[78] An integrated and ecosystem-based planning and management for ocean is therefore a key element of the AOP. The development of industry sectors with the concern on ecological sustainability that conduces to socio-economic welfare has been processed as one of initial actions. In terms of fisheries, sustainable fisheries management is a goal, and the measures to eliminate excess capacity from fisheries within country are continuously undertaken.[79] In terms of conservation of marine biological diversity, the development of the National Representative System of Marine Protected Areas (NRSMPA) is an important activity suggested under the AOP.[80] Since the AOP and its institutions and implementation methods were considered as a new world policy establishment of this kind, they have become a source of information and lessons for other States (e.g., Canada and New Zealand) to learn in order to establish their own ocean policies.[81] Nonetheless, as similar

[75] Anne B Hollowed et al, 'Are Multispecies Models an Improvement on Single-species Models for Measuring Fishing Impacts on Marine Ecosystems?' (2000) 57(3) *ICES Journal of Marine Science* 707.

[76] Fowler, above n 71, 932.

[77] Transform Aqorau, 'Obligations to Protect Marine Ecosystems under International Conventions and Other Legal Instruments' (Paper presented at the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, Reykjavik, Iceland, 1-4 October 2001) <ftp://ftp.fao.org/fi/document/reykjavik/pdf/02Aqorau.pdf> 8.

[78] *Australia's Ocean Policy*, 4.

[79] *Australia's Ocean Policy*, 25.

[80] *Australia's Ocean Policy*, 23.

[81] Joanna Vince, 'Ten Years of Implementing Australia's Oceans Policy: From an Integrated Approach to an Environmental Policy Focus' (2008) (159) *Maritime Studies* 1, 8.

as other new policy establishments, the process of AOP development is complex and timely. Thus, the prolonged commitment of the government on such policy implementation is truly essential. EBFM can be implemented in both developing and developed States.[82]

In summary, the EBFM is increasingly important in present fisheries and its development has been made substantially.[83] However, there are remained gaps in terms of necessary information to support such management due to the complexity and uncertainty of ecosystem. This consequently causes difficulties in choosing proper indicators and reference points for given ecosystem.[84] To conceive the complexity of ecological, social and economic environments of concerned fisheries is therefore the key of success, and the additional funding and resources will be needed for relevant researches. Clearly, it is difficult to effectively implement EBFM. Also, it is unlikely easy to use multispecies models. However, the potential benefits of EBFM including fishing capacity controls, particularly when applying MPAs with the combination of others tools (e.g., gear restrictions) could be as big as, unless more than, the possible consequences of not implementing any measures.[85]

6.2.2 Ecosystem-based Fishery and Multispecies Fisheries Management in Thailand's Context

According to the dramatic increase of the marine resources abundance in Thai waters due to overexploitation by destructive fishing vessels, particularly trawlers and push netters, Thailand has imposed a number of Notifications to demarcate the areas in which such fishing vessels are forbidden to operate.[86] These zones are the areas covering three kilometres or three nautical miles[87] from the coastline because these areas are considered as nursery grounds for marine resources. Although these regulations have rather concerned on marine resources conservation than ecosystem protection, the effect

[82] Sinclair et al, above n 1, 263.

[83] Chang Ik Zhang et al, 'An Ecosystem-based Fisheries Assessment Approach for Korean Fisheries' (2009) 100(1) *Fisheries Research* 26, 37.

[84] The identification of proper management indicators and reference points for assessment has been greatly taken into account by researchers. See, ibid 28.

[85] Pikitch et al, above n 8, 347.

[86] These Notifications are also discussed in Section 4.3.1.1.3 of Chapter 4.

[87] Only Trang, Krabi, Prachuab Kirikhan, Rayong, Narathiwat, Pattani, Satun and Nakhon Si Thammarat Provinces have three nautical mile reserve zones.

of these enforcements also mitigates the damage on coastal environment, particularly the seafloor, by trawlers and push netters.

Later, due to the scientific evidences showing that the nursery grounds of most marine species covering the area farer than three kilometres from the coastline, the Thai government has put the effort to expand such restricted area nationwide. It has resulted in the establishment of coastal fisheries zone (i.e., areas within three nautical miles from shore line or, if necessary in some areas, within 12 nautical miles from shore line) by the Fisheries Act B.E. 2558 (2015).[88] Fisheries regulations will be particularly imposed on this fisheries zone, for example, to specify types, sizes, numbers and components of fishing gears that are prohibited to operate in this zone. In this sense, the coastal fisheries zone can technically be considered as marine reserves established nationwide.

In terms of applying ecosystem model, Thailand has made an attempt to use it to evaluate possible fishery management measures. For instance, under the European Union project aimed to evaluate the social cost of fishing, the Department of Fisheries used an ecosystem model called the Ecopath with Ecosim (EwE) approach and software to compare the fishery status of year 1973, 2005 and predict for year 2010.89 EwE consists of three components, i.e., 'Ecopath - a static, mass-balanced snapshot of the system; Ecosim - a time dynamic simulation module for policy exploration; and Ecospace - a spatial and temporal dynamic module primarily designed for exploring impact and placement of protected areas.'[90] Ecosim in particular, incorporates the time series data on indices of resource abundance (such as survey data, CPUE data), absolute abundance estimates, catch production, effort of fishing vessels, operation rates, and the estimates of total mortality. With the analysis by using this data, Ecosim can provide policy exploration simulations in four areas of objectives, including: 'i) maximize fisheries rent; ii) maximize social benefits; iii) maximize mandated rebuilding of species; and iv) maximize

[88] There are three fisheries zones, i.e., coastal fisheries zone, offshore fisheries zone, and freshwater fisheries zone, established under the *Fisheries Act B.E. 2558 (2015)*. Details of this establishment are discussed under Section 4.3.1.1.3 of Chapter 4.

[89] Data series including time series of CPUE of a number of fish groups and fishing effort of six types of fleets (i.e., pair trawlers, otter board trawlers, beam trawlers, push netters, purse seiners and others) from the year 1973 to 2005 were used in analysis. See, Mala Supongpan, Ratanawalee Poonsawat and Villy Christensen, 'Introducing Ecosystem-based Management in the Gulf of Thailand' (Project No. 003711, 2005) 2.

[90] Ecopath with Ecosim, *About the Ecopath with Ecosim (EwE) Approach* (2015) <http://www.ecopath.org/about>.

ecosystem structure or 'health'.' For ecosystem structure optimization in particular, it usually suggests the reduction of fishing effort for all main types of fishing vessels that target concerned species. Thus, the estimates of time-series number of concerned fishing vessels that are beneficial the most to ecosystem structure would help in managing fishing effort or fishing capacity.[91] However, there was no clear evidence showing that the results obtained from the analysis have been significantly used in fisheries management of Thailand. The complexity of fisheries ecosystem of Thailand could probably be an obstacle in application.

6.2.3 Closed Seasons and Closed Areas

Closed seasons and closed areas are the management measures widely used for the purpose of biological conservation on marine resources. They, however, can also be applied to restrict fishing mortality on a stock.[92]

For **closed seasons**, there are two effective methods to implement this scheme. The first method, which is more popular, is to ban fishing activities during particular periods of the year in order to protect particular life history stages of a stock (e.g., juveniles or small fish) or during spawning season.[93] Nonetheless, using this measure alone as a main measure to control fishing capacity could be a problem. It is because the catch rate is expected to be very high outside the closed seasons, and this economic incentive will encourage fishers to increase fishing capacity in the fisheries for the most benefits.[94] The second method is to implement closed seasons based on the effect from fishing. For example, the fishing season will be closed when the catch rate decreases to a certain level.[95] This method, however, truly relies on the direct relationship between CPUE and stock abundance, so that it is not suitable for fisheries stocks that don't have such a strong relationship.[96] Furthermore, similar to the first method, this type of closed seasons tends to cause overcapitalization as fishers tempt to heavily invest at the beginning of the fishing season in order to get the most shares of the resources before

[91] Ibid.

[92] John R Beddington and R Bruce Rettig, *Approaches to the Regulation of Fishing Effort* (FAO, 1984) 11.

[93] Steve Cunningham and Dominique Greboval, *Managing Fishing Capacity: A Review of Policy and Technical Issues* (FAO, 2001) 38.

[94] Beddington and Rettig, above n 92, 11.

[95] Ibid.

[96] Ibid.

the fishing season is closed.[97] The typical consequence is that the length of the fishing season declines over time. Thus, unless the effective measures for capacity controls are concurrently implemented, the period of closed season for building the stock size could become longer.[98] Additionally, the issue of discontinuities of fish supply for the market should not be neglected when applying close season measure.[99]

Closed seasons are widely implemented on several species in the United States. For example, the commercial fishing for gray triggerfish in areas of North Carolina, South Carolina, Georgia and Florida States is closed during 7 July to 31 December 2013,[100] whereas the commercial fishing for spiny lobster is prohibited during 4 January to 8 May in the areas of Texas, Louisiana, Mississippi, Alabama and Florida States.[101] In some countries, however, fishing season is differently applied on the basis of sexuality of species. For instance, in Tasmania, Australia, the fishing season for male giant crabs is opened throughout 2013, while the fishing season for female giant crabs is opened only from 15 November 2012 to 31 May 2013.[102]

Similarly, **closed areas** are used to control fishing mortality of certain life history stages of species by, instead of setting closed periods, allocating a particular location as a closed area for fishing to shelter them.[103] In some cases, having protected areas is greatly useful in terms of protecting the portions of spawning stocks. However, to protect particular life history stages of species could result in the increased fishing effort on other age groups of species.[104] Therefore, closed areas should not be singly implemented to regulate fishing capacity.[105]

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[97] Ibid 12.

[98] Cunningham and Greboval, above n 93, 38.

[99] Beddington and Rettig, above n 92, 11.

[100] South Atlantic Fishery Management Council, *South Atlantic Snapper Grouper Complex Commercial Regulations* (22 July) <http://www.safmc.net/LinkClick.aspx?fileticket=iDSeeRPraZk%3d&tabid=248>.

[101] Gulf of Mexico Fishery Management Council, *Commercial Fishing Regulations for Gulf of Mexico Federal Waters* (20 May 2013) <http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/Commercial%20Brochure%202013.pdf>.

[102] Parks Department of Primary Industries, Water and Environment, *Commercial Fishing Seasons* (1 August) <http://www.dpiw.tas.gov.au/inter/nsf/WebPages/HMUY-5V26QL?open>.

[103] Beddington and Rettig, above n 92, 12.

[104] Ibid.

[105] Ibid.

A particular application of closed areas called 'Coastal Belt' has been adopted by a number of developing States. It aims to protect artisanal or small scale fishers from competition in fishing with more efficient vessels, such as trawlers, by allocating particular coastal areas exclusively for these fishers. Strong MCS, however, will be required in order to reach the goal.[106] Another popular kind of closed areas is a marine reserve. It is often used when alternative management measures are difficult to be implemented. It is also aimed to conserve part of fishery stock. The effect of a closed area on fishing capacity is similar to a closed season.[107]

Many States have implemented closed areas as a fishery management tool. For instance, the Gulf of Mexico Fishery Management Council of the Unites States has implemented marine sanctuaries and area closures for all fishing along the west-central coast of Florida from 1 November to 30 April. Such areas are located in federal waters, which begin three to nine nautical miles offshore to 200 nautical mile limit of the Gulf of Mexico.[108]

Another example is closed areas implemented in New England waters, i.e., three large areas on Georges Bank and in Southern New England (17,000 square kilometres in total), which are important for groundfish spawning and juvenile production. After five consecutive year closure of these areas to any gears used to catch groundfish (e.g., trawls, gill nets, hook fishing) the result showed the significant decrease of fishing mortality of depleted groundfish stocks.[109]

In sum, although closed seasons and closed areas, by themselves, are generally implemented for the main purpose of marine resources conservation and do not provide the substantial benefits in controlling capacity,[110] these measures can be implemented as supportive measures with other fishing capacity controls. Alternatively, they can be

[106] Ibid.

[107] Cunningham and Greboval, above n 93, 38-9.

[108] Gulf of Mexico Fishery Management Council, above n 101.

[109] Steven A Murawski et al, 'Large-scale Closed Areas as a Fishery-management Tool in Temperate Marine Systems: The Georges Bank Experience' (2000) 66(3) *Bulletin of marine science* 775.

[110] Dominique Greboval and Gordon Munro, 'Overcapitalization and Excess Capacity in World Fisheries: Underlying Economics and Methods of Control' in Dominique Greboval (ed), *Managing Fishing Capacity: Selected Papers on Underlying Concepts and Issues*, FAO Fisheries Technical Paper No. 386 (FAO, 1999) 206, 35.

applied as an initial measure for fisheries management since they are relatively easy to enforce, particularly for where suggested measures (e.g., right-based measures) are difficult to use. Indian government, for example, has increasingly used time-zoning for capture fisheries as other measures are unlikely practical.[111] The results, particularly at Tamil Nadu, showed the success.[112]

6.2.4 Closed Seasons and Closed Areas in Thailand's Context

Thailand has implemented closed seasons and closed areas of fisheries for decades. There are two significant areas seasonally closed in Thai waters, i.e., some certain area of Prachuab Kirikhan, Chumphon and Surat Thani Provinces (along the Gulf of Thailand) with the total area of 26,400 square kilometres (Figure 6.1)[113] and some certain area of Krabi, Pang-nga, Phuket and Trang Provinces (along the Andaman Sea) with a total area of 4,696 square kilometres (Figure 6.2).[114] The former area is closed during 15 February to 15 May,[115] whereas the latter area is closed during 1 April to 1 June of every year.[116] These two closures have the same main objective that to protect

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[111] Maarten Bavinck et al, 'Time-zoning for the Safe-guarding of Capture Fisheries: A Closed Season in Tamil Nadu, India' (2008) 32(3) *Marine Policy* 369, 369.

[112] Ibid 377.

[113] 'ปิดอ่าวไทย 3 เดือน ให้สัตว์น้ำขยายพันธุ์ [Close the Gulf of Thailand for 3 Months for Fish Enhancement]', *Daily News* (Bangkok, Thailand), 15 March 2013 <http://www.dailynews.co.th/agriculture/184633>.

[114] Deapartment of Fisheries, มาตรการปิดอ่าวฯ อันดามัน ที่ผ่านมา ผลสัตว์น้ำเพิ่มกว่า *2* เท่าตัว *31* มีนานี้ ดีเดย์ กรมประมงเตรียมปิดอีก *3* เดือน [*The measure of closed area of the Andaman Sea increased more than a double of marine resources, the Department of Fisheries will close the area again on 31 March for 3 months]* (22 March 2011) <http://www.fisheries.go.th/secretary/pr_old/news_detail.php?news_id=264>.

[115] Notification of the Ministry of Agriculture and Cooperatives Re: Prohibition of certain kinds of fishing appliances in spawning and breeding seasons in some localities of Prachuab Kirikhan, Chumphon and Surat Thani Provinces, given on 24 January B.E. 2550 (2007). It states that '...Clause 2. Spawning and breeding seasons shall begin from 15 February to 15 May of every year. Clause 3. During the specified period under clause 2, no person shall use fishing appliances as follows: (1) Every kind of trawls used with motor vessels except trawls used with only one motor vessel of which the length is not more than 16 meters and fishing only on night time (during sunset and sunrise); (2) Gill Nets and Entangling Nets used with a motor vessel in fishing by method of entangling for catching mackerel or by other similar method; (3) Every kind of gill nets used with motored vessels except with longtail motored vessels...; (4) Every kind of surrounding nets used with motored vessels; (5) Falling Nets or lift nets used with an electricity generator (or dynamo) in fishing of anchovies; (6) Push nets used with a motor vessel of more than 14 meters in length...'.

[116] Notification of the Ministry of Agriculture and Cooperatives Re: Prohibition of certain kinds of fishing appliance in spawning and breeding seasons in some localities of Phuket, Phang-nga, Krabi and Trang Provinces during specified period, given on 24 October B.E. 2551 (2008). It states that '…Clause 2. Spawning and breeding seasons (conservation season of young fish) shall begin from 1 April to 30 June of every year. Clause 3. During the specified period under clause 2, no person shall use fishing appliances, i.e., all kinds and all sized of trawls used with a motored vessel, surrounding nets and gill nets

the resource stocks from being caught, particularly the stocks of Indo-Pacific mackerels that have spawning and breeding seasons in these particular areas and periods. In the attempt to better protect these spawning areas, fishers in adjacent areas of the closed areas (e.g., fishers in Satun Province, which is connected to Trang Province)[117] are also encouraged to stop fishing during the indicated periods.

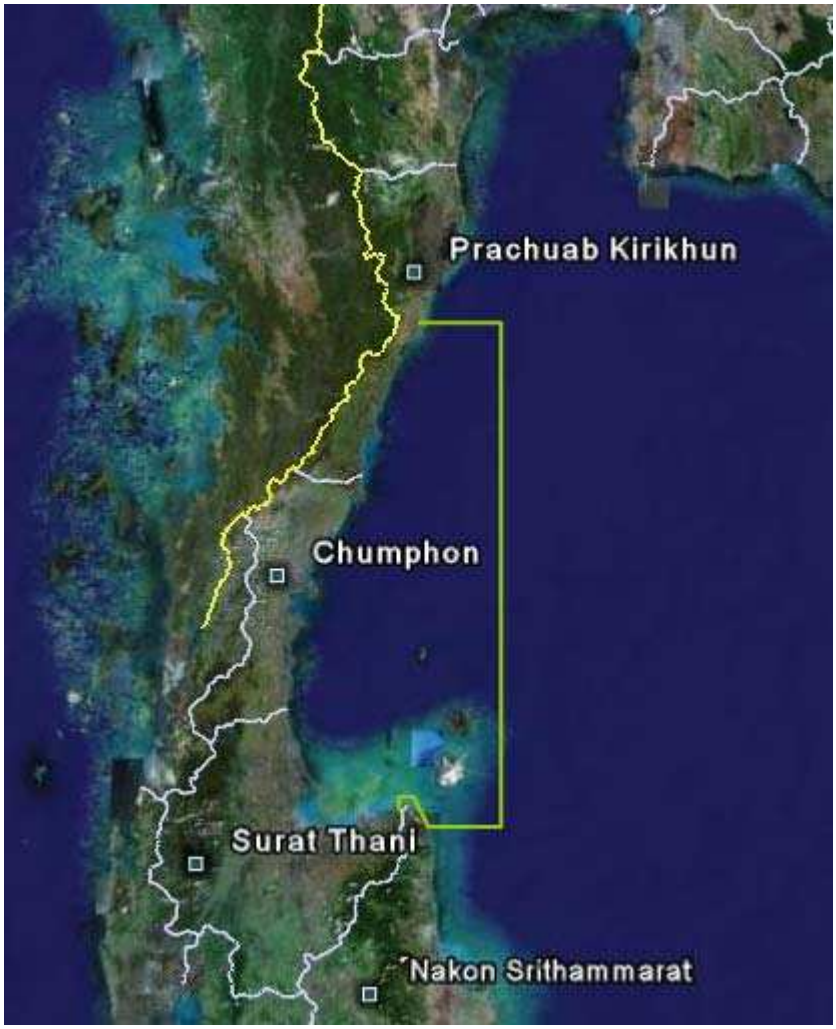

Figure 6.1: Marine territory of the closed area in Prachuab Kirikhan, Chumphon and Surat Thani Provinces

Source of map: Nopparat Nasuchon, The Challenge of Fisheries Management in Thailand, a Case Study of Closed Areas and Season in Prachub Khirikhan, Chumphon and Surat Thani Provinces (2013) <https://www.idmarch.org/document/Anti-aircraft+warfare/n3ad-show/The+Challenge+of+Fisheries+Management+in+Thailand%2C+a+Case+Study+of+Cl

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and entangling nets, of which their meshes are smaller than 4.7 centimeters in width, in fishing in some areas of Phuket, Phang-nga, Krabi and Trang Provinces...'

[117] ASTV Manager Online, 'ประมงสตูลแนะชาวเลงดทำประมงในฤดูปลาวางไข่ ตั้งแต่ เม.ย.-มิ.ย. นี้ [Satun Fisheries Officers Suggest Fishers to Stop Fishing during Spawning Season from April to Jun]', *Manager Online* (Bangkok, Thailand), 17 February 2012 <http://www.manager.co.th/Local/ViewNews.aspx?NewsID=9550000022223>.

osed+Areas+and+Season+in+Prachub+Khirikhan%2C+Chumphon+and+Surat+Thani+Provinces+BY>.

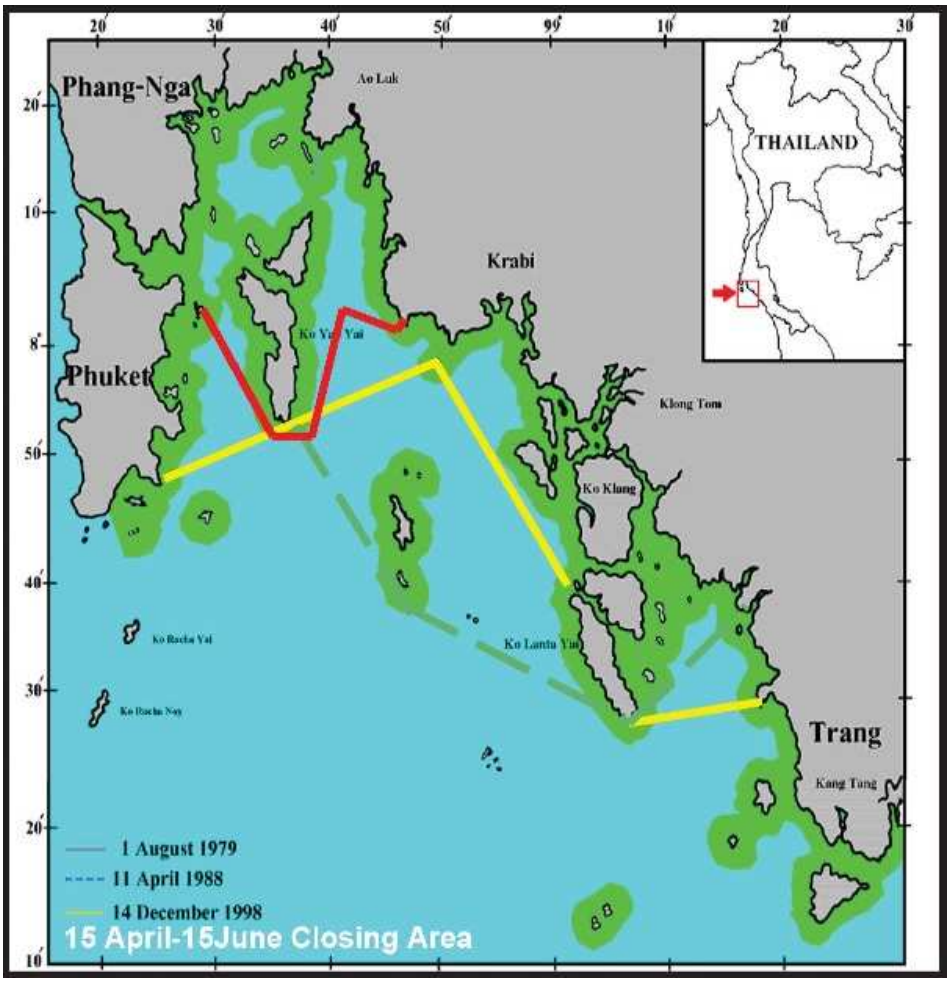

Figure 6.2: Marine territory of the closed area in the Andaman Sea

Source of map: Sampan Panjarat, Sustainable Fisheries in the Andaman Sea Coast of Thailand (2008) <http://www.un.org/depts/los/nippon/unnff_programme_home/fellows_pages/fellows_papers/panjarat_0708_thailand_PPT.pdf>.

After implementing these closures, the results clearly show the positive impact on both marine stocks abundance and fishers' income. Marine stocks in the Gulf of Thailand are significantly enhanced during closed season (2.33 times) and after closed season (1.98 times). For the Andaman Sea, the catch value increases 40 per cent at the end of closed season[118] and the CPUE increases to the level of 300-400 kilogram/hour.[119] Based on

[118] Naew Na, ''กรมประมง' แจงผล ปิดอ่าวไทย-อันดามัน สัตว์น้ำเพิ่มขึ้นเท่าตัว มูลค่าเกือบ 300 ล้านบาท [Department of Fisheries stated that closing the Gulf of Thailand and the Andaman Sea resulted in the double of marine resources valued almost THB300 Million]', 27 July 2012 <http://www.naewna.com/local/15797>.

[119] Department of Fisheries, กรมประมงร่วมมือชาวประมง สมาคมประมง จัดทำแนวทางนำร่องปิดอ่าวไทย รูปตัว ก เร่งรัดฟื้นฟูทรัพยากรสัตว์น้ำ [*Department of Fisheries Cooperate with Fishers and Fisheries Associations in Preparing the Approach*

the prolonged benefits of these closures, another closed area in the Gulf of Thailand has been recently established in 2014. This new closed area is part of the inner Gulf of Thailand located in seven provinces (i.e., Samut Sakhon, Samut Songkhram, Samut Prakan, Phetchaburi, Chonburi, Chachoengsao, and Prachuab Kirikhan) with a total area of 4,900 square kilometres (Figure 6.3). This closure is annually applied during 1 June to 31 July and aims for marine stock reservation as this area is an important nursery ground for juveniles of Indo-Pacific mackerels.[120]

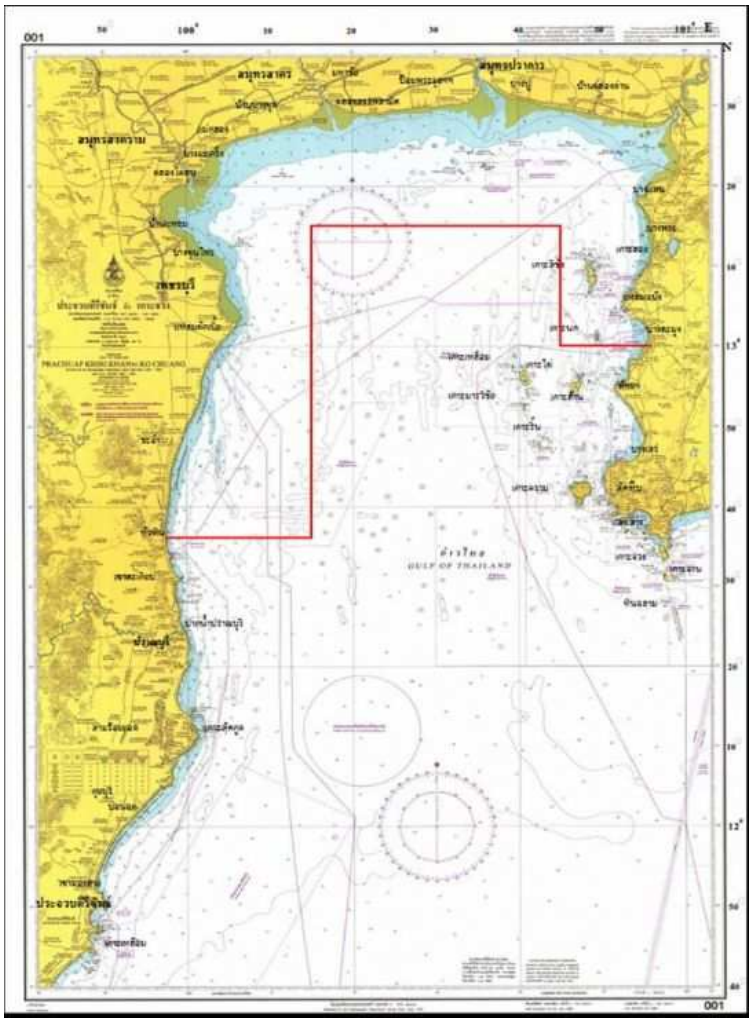

Figure 6.3: Marine territory of the closed area in the inner Gulf of Thailand

Source of map: Department of Fisheries, The Closed Area in the Inner Gulf of Thailand (18 July 2013) http://www.fisheries.go.th/mf-umdec/.

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to Close the Inner Gulf of Thailand for Marine Resources Rehabilitation] (8 March) <http://www.fisheries.go.th/secretary/pr_old/news_detail.php?news_id=258>.

[120] Upper Gulf Marine Fisheries Research and Development Center, ความเป็นมาของแนวทางการอนุรักษ์สัตว์น้ำบริเวณอ่าวไทยตอนใน (ปิดอ่าวตัว ก) [*Background of Marine Resources Conservation in the Area of the Inner Gulf of Thailand]* <http://www.fisheries.go.th/mf-umdec/>.

But, the benefit of closed seasons and closed areas in terms of fishing capacity reduction is relatively small. It is because in reality fishing vessels do not stop operating during closed seasons, but move to operate in other fishing grounds outside the closed areas. For example, fishing vessels that normally operate in the Gulf of Thailand mostly move to fish in the Andaman Sea during closed season of the Gulf. These vessels therefore increase the capacity allocated in the Andaman Sea during such period and worsen the problem of overfishing in that area. As soon as the Gulf is opened, they move back to race for fish in their usual fishing grounds. The problem of overcapitalization has therefore remained. To address this issue more effectively, Thailand should consider issuing fishing licenses that subjecting to not only fishing gears but also fishing areas (e.g., based on provincial area).

Apart from the closures mentioned above, coastal fisheries zone recently established by the new Fisheries Act could be considered as closed areas or 'Costal Belt' along the entire coasts of Thailand. Supplementary regulations enforced within this zone are still needed to issue though.

Similar to other management measures implemented in Thailand, the MCS is a fundamental factor for the success of closed seasons and closed areas. To strengthen MCS in marine fisheries, the Master Plan has also adopted the project to improve the effectiveness of MCS by installation the VMS on commercial fishing vessels operating in Thai waters.[121] Furthermore, as the community-based fisheries management is progressively adopted in Thai fisheries, the cooperation between fisheries communities and government officers, particularly in terms of MCS, is increased. The raised number of prosecution during closed seasons suggests better surveillance due to such increased cooperation. This also strengthens the awareness on marine resource reservation of fishers in the communities.[122]

6.3 Conclusion

This chapter presented some management measures, i.e., ecosystem-based fishery and

[121] *The Master Plan*, strategy 3, measure 2, project 6.

[122] Naew Na, above n 118.

multispecies fisheries management, closed seasons and closed areas, which can be used as supplementary measures for fishing capacity controls. Generally, the main purposes of these measures are for marine resources conservation or rehabilitation, and they are implemented on the basis of zone establishment. These measures unlikely provide substantial benefits on fishing capacity reduction. Nonetheless, as these measures appear not to be complicated to implement (e.g., MPAs, time-area closure) they are often suggested to be initial measures for fisheries management, particularly when more complicated measures (e.g., right-based management measures) are not feasible. Thus, despite the fact that Thailand has adopted these measures, particularly closed seasons and closed areas, for a long time and unlikely obtained the explicit benefits in terms of capacity reduction, they remain useful in Thai fisheries context (i.e., multi-gear, multi-species fisheries). These measures should therefore be promoted to implement in wider areas of Thai waters, but probably with a better design. However, as similar as most of management measures, the effective MCS is a critical factor for the success of the implementation of these measures.

CHAPTER 7 LEGAL AND INSTITUTIONAL CHALLENGES AND POLICY OPTIONS FOR MORE EFFECTIVE FISHING CAPACITY MANAGEMENT

7.1 Introduction

Taking all the findings in previous chapters into consideration, particularly the criteria analysed in Chapter 3 and discussions in Chapters 4-6, this chapter identifies the gaps and challenges in the legal and institutional framework to manage fishing capacity in Thailand. This chapter subsequently proposes options and recommendations for Thailand to effectively manage fishing capacity in order to ensure sustainable fisheries within and beyond its EEZ. The options concern legal, policy, institutional and management tools.

7.2 Gaps and Challenges in Managing Fishing Capacity in Thailand

According to the discussions in earlier chapters, it is clearly seen that Thailand has confronted the severe problem of overcapacity in marine fisheries and greatly attempted to address the problem, but it is unlikely that their effort made the desirable outcome as such problem still exists. Gaps and challenges of Thailand in managing fishing capacity are examined based on the findings, particularly the criteria for fishing capacity management derived in Section 3.4 of Chapter 3.[1] These gaps and challenges are identified as follows:-

[1] Details of criteria are presented in Table 3.1 under Chapter 3. A series of actions for States to take in order to sustainably manage their fishing capacity are concluded as the following:

'1. States should determine their current fishing capacity by implementing systematic measurement plan in their national policy framework;

2. States should assess the level of their fishing capacity whether there is excess capacity and/or overcapacity problem, as well as examine the factors contributing to it;

3. Where excess capacity and/or overcapacity exist, States should immediately address the problem by implementing proper management tools;

4. Where overcapacity issues have not yet arisen, precautionary management tools should be implemented in order to prevent their occurrence. States should develop national plans of action for fishing capacity management; and

5. State should participate in relevant international agreements and cooperate with other States through regional fisheries management organisations or arrangements to address overcapacity problems.'

7.2.1 Outdated, Impractical and Inadequate Legal and Policy Arrangements Supporting the Management of Fishing Capacity

According to the criteria and series of actions for fishing capacity management that States should determine their current fishing capacity, assess such level of capacity whether excess capacity and/or overcapacity exists, and address it accordingly, States, therefore, must have appropriate legal and policy framework that adequately supports such actions.

However, based on the analysis in previous chapters, it clearly shows that the legal framework for fishing capacity management in Thailand is insufficient, inefficient and fragmented. It is mainly because the national legislation, particularly the principle fisheries law and supporting laws and regulations, are outdated for present fisheries of Thailand. Before the enactment of the *Fisheries Act B.E. 2558 (2015)* in January 2015, Thailand had only one principal fisheries law, which is the *Fisheries Act B.E. 2490 (1947)* promulgated more than 65 years ago with the main purposes of collecting fisheries taxes and managing freshwater fisheries. Its provisions do not significantly concern on fishing capacity management as either overcapacity or overfishing was not an issue of Thai fisheries (or even world fisheries) during that time. Thus, provisions supporting the implementation of capacity controls are not adequately provided. Although this Act empowers the Minister of Agriculture and Cooperatives or the Provincial Governor to govern fisheries activities (e.g., through the Ministerial Regulations, the Departmental Regulations), which to some extent is believed adequate to manage the current fisheries situation in Thailand. But, in reality there are loopholes in many aspects.

Due to the inadequacy of necessary fishery policy, there is a lack of systematically determination of fishing capacity of Thai fisheries within and beyond the areas of national jurisdiction. Even though Thailand has attempted to measure input-based capacity (i.e., the number of fishing vessels and fishing gears) through the projects under the Master Plan, the measurement does not cover all existing fishing vessels and fishing gears due to a number of difficulties. For instance, small-scale fishing vessels, which are majority of Thai fishing vessels, disperse widely in fishing villages along the coastal areas of the Gulf of Thailand and the Andaman Sea, and thus it is difficult to

obtain the accurate number of these vessels. Furthermore, based on the provision within the *Fisheries Act B.E. 2490 (1947)* those small-scale fishing vessels, which are non-powered and smaller than six GT, are not obliged to register, so that a numerous number of them is omitted from national fisheries statistics. Furthermore, under this Act all types of fishing gears are categorized into two groups, i.e., (i) license fishing implement: fishing gears of this group are specified in the ministerial Regulation. They are legally required to register and pay endorsement fee upon registration; and (ii) non-license fishing implement: all fishing gears that are not fallen into the first group belong to this group and are not required to register. Fishers can use these gears without the fishing license. Thus, fishing gears in the second group are not included in the official records of fishing gears currently used in Thailand. Moreover, the majority of fishing vessels that operate outside Thai waters are under fishing arrangements between private sectors of concerned countries, which are difficult to be monitored by the Department of Fisheries. Clearly, these loopholes should be addressed by making legal requirement for all types of fishing vessels and fishing gears to be registered or recorded systematically with reasonable endorsement fee, both those operating in national waters and overseas.

In terms of co-management and community-based fisheries management systems, there are several national laws facilitating the implementation of these systems in Thai fisheries. The principle legislation was the formal *1997 Constitution*, which aimed 'to promote the participation of people in the governance under democratic system at local and national level.' The *Constitution* granted local people the right to establish their own self-government, and the local government organisations could issue policies for their governance, administration, personnel administration, and finance. A number of laws were enacted to support and harmonise the *Constitution*, particularly in terms of decentralization.[2] The National Economic and Social Development Plans further support the concept and the implementation of CBFM scheme.[3] Nonetheless, the outcomes of pilot projects conducted by the Department of Fisheries[4] demonstrated the

[2] They are including Determining Plans and Process of Decentralization Act of 1999, and Local Government Personnel Management of 1999, Pattaya Administration Act of 1999, Subscription for Proposal of Local Ordinance Act of 1999, Voting for the Removal from Office of Local Executives and Members of Assembly of 1999, and Election of Member of Local Assembly and Local Executives Act of 2002.

[3] Thai government firstly included CBFM in the Eight National Economic and Social Development Plan (1997-2001).

[4] Details of pilot projects are discussed under Section 5.2.3 of Chapter 5.

inadequacy of legal arrangements and administrative supports to facilitate the co-management and CBFM systems in Thailand. For example, in terms of legal enforcement, fishers or fisheries communities are not granted a legitimate power to protect their coastal areas from the intruders.[5] Some national laws have still reflected the centred approach to resource management and the restricted property rights, which have constrained people to involve in the community-based systems. Especially, the outdated *Fisheries Act B.E. 2490 (1947*) did not provide any provisions concerning either co-management or fishing right based concepts. It could be because these concepts did not exist during such period. This Act granted only the right to persons to fish in concession and reserved fisheries, which can be viewed as individual fishing right. Besides, none of the recognition of fisher groups or fisheries communities was prescribed under this Act. Moreover, there was none of legislative arrangement on fisheries organisations or fisheries cooperatives. Although Provincial Administration Organisation and Tambol Administrative Organisation have been later established and played the leading role in developing and managing the projects and activities at local levels, they, especially during the initial stage of these organisations' establishment, put the priority concerns on the capacity of infrastructure within their responsible areas rather than the activities of fisheries management. Thus, it is essential that the laws that recognise the fishing rights and promote the CBFM for local fishers, fisheries communities and fisheries organisations are truly required. The mechanisms for these people to participate to the systems and for the systems to sustain are also needed under the new laws. Unless these issues are addressed properly, the CBFM system cannot provide the ultimate outcome in terms of fishing capacity controls for Thai fisheries.

The Master Plan for Marine Fisheries of Thailand which supports the issues of new laws and regulations that harmonising the new Fisheries Act, has become the important policy arrangement for capacity reduction in Thai fisheries. Under the five strategies of the Master Plan,[6] fisheries projects have been designed to support the objectives of each

[5] Details concerning this issue are already presented under Section 5.2.3 of Chapter 5.

[6] The Master Plan formulates five strategies to address components in marine fisheries management, i.e., '(i) effectively improving the system of marine fisheries management and the co-management; (ii) strengthening structure and capability of fisheries organisations; (iii) developing and promoting responsible and sustainable utilisation of marine fisheries resources; (iv) rehabilitating marine ecosystem and fishing grounds in order to safeguard biodiversity and marine environmental quality; and (v) promoting and developing distant water fisheries.' Details of strategies concerning fishing capacity management are already discussed in Section 2.6 of Chapter 2.

strategy. The capacity reduction-related issues, such as improved fishing gear registration, fishing capacity for sustainable fisheries, trawlers and push netters reduction and the development of alternative employment opportunities for fisheries stakeholders are clearly stated under the first strategy of the Master Plan. However, no explicit reference point of capacity reduction has been set as an objective within the Master Plan. Thailand has conducted neither the determination of national fishing capacity nor the development of the reference point set for the capacity control. Therefore, Thailand needs to adopt the national agenda on the fishing capacity determination and reduction, particularly of marine fisheries. The National Plan of Action for the Management of Fishing Capacity of Thailand (Thailand NPOA-Capacity) must be developed accordingly.

In terms of law enforcement, difficulties are regularly found due to the fact that the relevant legislation is impractical or unclear for fisheries enforcement in some circumstances. A significant issue is that any cases of fisheries law violation must be submitted to the civil court of competent province within 48 hours, which is quite a short period. It means that the suspension of fishing operation during the court's prosecution is also short, and thus the fishers and fishing vessels can return to operate quickly. Furthermore, the sea boundary of provinces in Thailand is not all clear as only some provinces have the explicit line of provincial boundary in the sea. When the law violation is happened at sea, it causes uncertainty for the officers to decide about which provincial court is responsible for such case. Besides, when the case of violation is prosecuted at the Court, the fishing gear and the fishing vessel involved are separately investigated based on a Thai law. Based on Section 33 of the Criminal Code of Thailand states that:

> 'For the forfeiture of a property, the Court shall, besides having the power of forfeit under the law as specially provided for that purpose, have the power to forfeit the following properties also, namely:
>
> (i) A property used or possessed for use in the commission of an offence by a person; or
>
> (ii) A property acquired by a person through the commission of an offence.
>
> Unless such property belongs to the other person who does not connive at the commission of the offence.'

The fishers, therefore, take advantage of this loophole by renting a fishing vessel from the owner, as when they violate the fisheries law, the Court cannot forfeit the fishing vessel. Such fishing vessel can continue operating in the sea.

Additionally, as discussed earlier under Section 5.2.4 of Chapter 5 (TURFs section), the enactment of the *1997 Constitution* has greatly given the decentralized power to local sector of Thai society. New laws and law amendments have been promulgated to support and harmonize the *Constitution*. At local level, people are urged to take part in the governance or establish self-government. Also, the CBFM was firstly included in the *Eight National Economic and Social Development Plan (1997-2001)*. This National Plan has given the guidelines for fishery policy establishment later conducted.[7] But, it is important to note that the *Constitution* and relevant fisheries regulations do not grant any management and/or enforcement authority within their coastal areas to fisheries communities (e.g., legitimate power to detain violators). This constraint can induce the difficulties in CBFM implementation.[8]

7.2.2 Lack of Proper Technical Support in Setting Reference Points

Apart from difficulties in determining the present fishing capacity, there are also obstacles for Thailand to obtain the accurate reference point, i.e., biological reference point, used to assess the fishing capacity level whether it is at the state of excess capacity and/or overcapacity.

Although some qualitative indicators for overcapacity have been clearly detected in Thai fisheries,[9] an explicit biological reference point (i.e., MSY) is still required to enable decision makers to develop appropriate harvest strategies to ensure sustainability of fishing activities and fishery resources. But, due to the nature of tropical fisheries of Thailand, which has multi-gear and multi-species characteristics to conduct scientific researches in order to obtain accurate data and information required for MSY analysis is

[7] Donna J Nickerson (ed), *Community-based Fisheries Management in Phang-nga Bay, Thailand. Proceedings of the National Workshop on Community-based Fisheries Management Organized by the Department of Fisheries of Thailand, FAO and the Bay of Bengal Programme, Phuket, Thailand, 14-16 February 1996* (FAO, 1998) 3.

[8] The new Fisheries Act has attempted to address this issue by empowering fisheries communities in governing fisheries management in their areas.

[9] Details can be viewed in Section 1.3 of Chapter 1.

not easy to achieve. For example, same species may be caught across fishing gears or some species may be targeted at multiple life history stages by different fishing gears (e.g., juvenile shrimps are targeted inshore by push netters, whereas the adult shrimps are targeted offshore by trawlers). This nature of fisheries limits the efficiency in collecting comprehensive fisheries data, especially fishing effort, catch landings and catch composition that are essential in MSY analysis. Therefore, technical and financial supports are truly required for effective analysis of MSY. The public costs from conducting data collection and researches could raise a question of worthiness, particularly in developing countries, which having limited budget like Thailand.

In addition, the models for analysing MSY have been criticized against as they likely have limited application on multi-species fisheries of tropical or subtropical areas. It could be due to the fact that such models have been originally developed by concerning temperate stocks, which are much less complicated in nature than the tropical or subtropical stocks.[10] Besides, stock assessments basically depend on assumptions and subjective decisions, thus the result may vary depending upon which stock assessment model is applied, as well as the accuracy and completely of information gathered.[11] Uncertainty could also be underestimated if the only model is used.[12]

However, similar to other tropical countries, Thailand has made a number of attempts to carry out researches aimed for obtaining initial MSY of important economic species.[13] But, it is unlikely that such MSY(s) has been used as a biological reference point for fisheries management since it is problematic in practice due to open access system of multi-gear and multi-species fisheries of Thailand.[14] For instance, fishing vessels equipped with less selective fishing gears (e.g., trawlers and push nets) basically catch numerous species[15] at different sizes, thus it could be problematic to limit the catch amount of each species (of particular size) as at its different sustainable level. Further,

[10] Robert S Pomeroy and Meryl J Williams, *Fisheries Co-Management and Small-scale Fisheries: A Policy Brief* (ICLARM, 1994) 3.

[11] For example, the MSY in the Gulf of Thailand analysed with the historical catch data up to 1995 by using the estimation of the Gordon - Schaefer Model and Fox Model were different. See, FAO, 'Report of the National Seminar on the Reduction and Management of Commercial Fishing Capacity in Thailand. Cha-Am, Thailand, 11-14 May 2004.' (FIP/FCR13, FAO, 2005) <http://www.fao.org/docrep/008/j6419e/j6419e00.htm> 39.

[12] Timothy E Essington, 'The Precautionary Approach in Fisheries Management: the Devil is in the Details' (2001) 16(3) *Trends in Ecology & Evolution* 121.

unacceptable level of discards might be made by fishers in order to meet the allowable catch. Nonetheless, to apply the MSY (or MEY) of overall stock to the fishery by optimizing the MSY (or MEY) across all key species in the same group (e.g., demersal fish) could be done. But, adjusting such MSY (or MEY) to favour all important species is very challenging and must be carried out with care and expertise.

To address this issue, using procedures of direct data-based assessment could be more adaptable than using indirect methods that more depend on complicated mathematic models.[16] To properly manage the stocks (and the fishing capacity concerned) by taking into account the limitations of the fishery science, particularly in terms of fishery stock analysis or models, are also necessary.[17]

7.2.3 Inadequacy of Effective Measures Used to Manage Fishing Capacity

As heavily discussed in Chapter 4 (incentive blocking measures), Chapter 5 (incentive adjusting measures) and Chapter 6 (supplementary management measures), Thailand has already implemented various types of measures that either directly or indirectly manage fishing capacity. Most of these measures however emphasise on the purpose of rather marine resources conservation than fishing capacity controls. For example,

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[13] The most recent attempts to estimate the MSY of important economical species in Thai waters were conducted in 2007. See, Amnuay Kongprom et al, *Stock Assessment of Purple-Spotted Bigeye (Priacanthus tayenus Richardson, 1846) in the Gulf of Thailand* (the Department of Fisheries, 2010); Sonthaya Boonsuk et al, 'Stock Assessment of Round Scad *Decapterus maruadsi* (Temminck & Schlegel, 1843) along the Andaman Sea Coast of Thailand' (Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives, 2010); Amnuay Kongprom et al, 'Stock Assessment of Mitre Squid (*Photololigo chinensis*) and Indian Squid (*P. duvaucelii*) in the Gulf of Thailand' (Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives, 2010); Montri Sumontha et al, 'Stock Assessment of Indian Mackerel (*Rastrelliger kanagurta* (Cuvier, 1816)) along the Andaman Sea Coast of Thailand' (Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives, 2010); Sonthaya Boonsuk et al, 'Stock Assessment of Anchovies (*Encrasicholina devisi* (Whitley, 1940), *E. punctifer* Fowler, 1938 and *E. heteroloba* (Ruppell, 1837) along the Andaman Sea Coast of Thailand' (Marine Fisheries Research and Development Bureau, Department of Fisheries, Ministry of Agriculture and Cooperatives, 2010).

[14] About a decade ago, the Department of Fisheries attempted to estimate the MSY of fish stocks and commensurate fishing labour in the Gulf of Thailand by using the Gordon-Schaefer Model, which suggested that the fishing labour should be reduced for 40 per cent in order to meet the sustainable level. For anchovy stock in particular, the research suggested that the fishing labour for anchovy fishery should be reduced from 25 to 30 per cent. But it is likely that these findings have never been significantly applied into the national fishery policy of Thailand. See, FAO, above n 11, 45.

[15] They are including demersal fish, pelagic fish, cephalopods, shrimps, and crabs.

[16] Essington, above n 12.

[17] John R Beddington and R Bruce Rettig, *Approaches to the Regulation of Fishing Effort* (FAO, 1984) 33.

Thailand has implemented closed seasons in the main spawning grounds of the Indo-Pacific mackerels in the Gulf of Thailand and the Andaman Sea in order to conserve these stocks, but the number of fishing gears mainly used to harvest such species (e.g., purse seines, gill nets) has never been controlled. The economic importance of fisheries industry in Thailand, particularly canned fish industry that requires the huge amount of raw fish supply, causes a big challenge for Thailand to balance the concerns among marine resources conservation, fishing capacity controls and fisheries production for industry supply.

According to the discussion under Section 4.3.1.1 of Chapter 4, it demonstrated that input controls alone (e.g., mesh size regulations and gear restrictions, limitation the number of push netters and trawlers) might be insufficient to effectively manage fishing capacity in Thai fisheries as these measures, in their effect, do not decrease the incentives to harvest fish of fishers. On the other hand, they could increase incentives of fishers to invest for more profits. Therefore, Thailand should seriously consider implementing the output controls concurrently with the input controls currently used.

Another issue that should be strictly addressed is the inconsistency of national fisheries policy in terms of the limitation of the number of destructive fishing gears, particularly trawlers. One of the explicit examples is when the Department of Fisheries made the attempt to grant amnesty to more than two thousands unregistered trawlers in 2012 due to the big pressure from fishing export industry. This action was viewed against the government's prolonged policy in freezing the number of registered trawlers.[18] This policy uncertainty not only lessens the effectiveness of implemented fishing capacity controls but also creates conflicts in fisheries society, between small-scale fishers and trawl fishers in particular. Moreover, the issue of transparency of the authority concerned (i.e., the Department of Fisheries) could probably be questioned by stakeholders, particularly small-scale fishers.

The lack of follow-up activities after the implementation of management measures is also continuously appeared. This indeed undermines the effect of such measures on capacity controls. For instance, after the implementation of the vessel buyback scheme

[18] More details are presented in Section 4.3.1.1 of Chapter 4.

in push net fisheries, it was unlikely that the explicit activities were conducted to certainly prevent the return of those push netters. Although the government has attempted to develop alternative skills and career opportunities (e.g., aquacultures) for these fishers, there is still no guarantee whether these fishers would forever stay out of the push net fisheries as such fishing gears and vessels still exist. The fishing capacity reduction could therefore be offset by new entrants with old fishing gear and vessel.[19] Thus, it is crucial that not only the proper management measures must be implemented, but also the appropriate and strict follow-up activities must be carried out to ensure the effective and sustainable outcome of capacity controls.

Since socio-economic information is necessary in policy and planning process nowadays, the socio-economic aspect cannot be avoided when designing the appropriate measures to control fishing capacity, especially for those implemented on small-scale fisheries. However, providing small-scale fishers the practical employment and livelihood alternatives is not always desirable as, most of the cases, fishers cannot easily switch to agriculture or livestock production-orientated livelihoods due to their constraints in terms of, for instance, land and knowledge required for alternative livelihoods.[20] Furthermore, their mindset of "fishing today and not worrying about tomorrow" could be an obstacle for them to accept other activities that require long-term planning.[21] Taking these factors into consideration, to properly design and implement the capacity measures on small-scale fisheries is very challenging and costly for the Thai government to meet all required arrangements.[22]

7.2.4 Inadequacy of Monitoring Control and Surveillance System

Insufficiency of monitoring control and surveillance system is likely a fundamental issue for developing countries that have limited budget, manpower and equipment to effectively implement such system in their fisheries. Although Thailand has annually

[19] Theo Ebbers and Rick Gregory, 'Capacity Development for Improving the Knowledge Base for Fisheries Management in Southeast Asia - a Regional Initiative, Implemented Locally' (APFIC Ad Hoc Publication, FAO Regional Office for Asia and the Pacific, 2009) <http://www.apfic.org/uploads/wfd_124079351849f50185b51a1--capacity.pdf> 52.

[20] Ibid 51.

[21] Ibid.

[22] Ibid.

allocated a remarkable budget for enforcement services, particularly to marine capture fisheries sector,[23] the issue of an inadequacy of officers and patrol boats operating along the long coastal line (2,614.40 kilometres) still remains. This could also raise a question whether the benefits gained from the recovery of fisheries resources would be worth the operation cost for law enforcement.

In terms of monitoring system, particularly vessel monitoring system (VMS) installation, Thai fishing vessels that operate in Thai waters are not required to install VMS based on the *Fisheries Act B.E. 2490 (1947)*. This loophole is another obstacle to control fishing capacity in Thai fisheries.

7.2.5 Insufficient Cooperation among Relevant Agencies

As obviously seen in the previous chapters, the Department of Fisheries has been the principal government agency who plays the most crucial role in developing and managing fisheries in Thailand.[24] The fundamental responsibilities of the Department of Fisheries include: (i) to implement and enforce the laws and regulations that are relevant to fisheries, such as the *Fisheries Act B.E. 2490 (1947)*, the *Wildlife Conservation and Production Act B.E. 2535 (1992)*, the *Enhancement Conservation of National Environmental Quality Act B.E. 2535 (1992)*; (ii) to conduct studies, researches and experiments in all subjects of fisheries; (iii) to explore, study and analyse fishing grounds beyond the areas of national jurisdiction, as well as promote fisheries cooperation with other States; (iv) to promote and develop the fisheries careers; and (v)

[23] Government Financial Transfers (GFTs) in Thailand were USD27 million in 2009; 83.3 per cent to aquaculture sector and 16.7 per cent to marine capture sector. GFTs to aquaculture included disaster relief payments USD12.1 million, management services USD9.4 million and research services USD1 million. GFTs to marine capture fisheries included enforcement services USD3.3 million, management services USD0.7 million and research services USD0.5 million. The transfers to marine capture increased by 4.5 per cent per year, which were for general services only. See, OECD, *OECD Review of Fisheries 2011: Policies and Summary Statistics* (OECD Publishing, 2012) 546.

[24] Department of Aquatic Animal Conservation was established on 21 September B. E. 2469 (1926) and was renamed as Department of Fisheries since 1 January B.E. 2497 (1954). See, Department of Fisheries, *Brief Background* (2014) <http://www.fisheries.go.th/dof/en/index.php?option=com_content&view=article&id=1&Itemid=2>.

carry out any tasks assigned by laws and the Ministry or the Cabinet.[25] The structure of the Department of Fisheries is shown in Figure 7.1 below.[26]

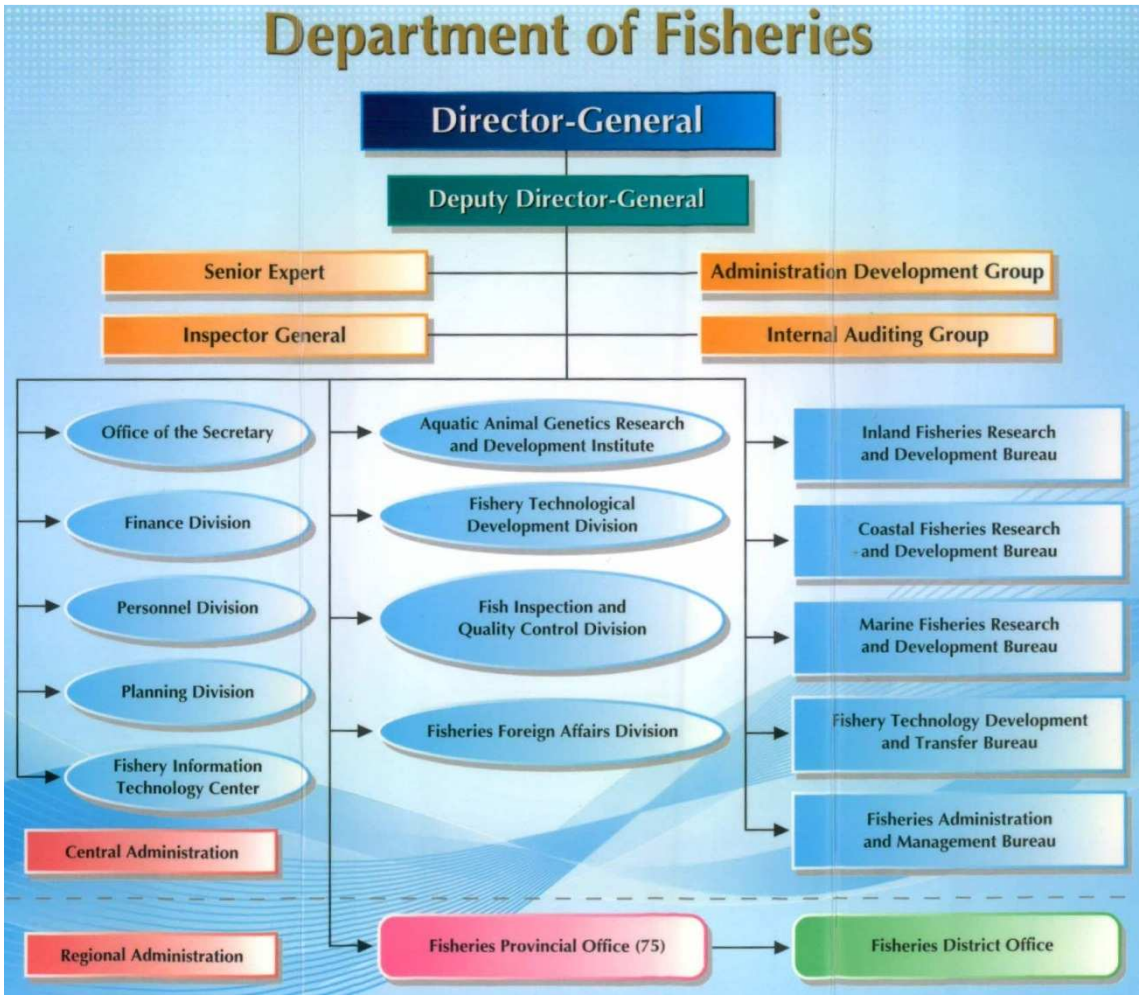

Figure 7.1: Organisation Chart of the Department of Fisheries (as of January 2014)

Source of figure: Department of Fisheries, Brief Background (2014) <http://www.fisheries.go.th/dof/en/index.php?option=com_content&view=article&id=1&Itemid=2>.

[25] Department of Fisheries, *Responsibility* <http://www.fisheries.go.th/dof/en/index.php?option=com_content&view=article&id=2&Itemid=4>.

[26] The Department of Fisheries reengineered in 2002, is comprised of central and regional administrations. The central administration includes the Administrative Offices, six Divisions (Fish Inspection and Quality Control Division, Fisheries Foreign Affairs Division, Fishery Technological Development Division, Personnel Division, Finance Division, Planning Division), one Centre (Fishery Information Technology Centre), one Institute (Aquatic Animal Genetics Research and Development Institute), and five Bureaus (Fisheries Administration and Management Bureau, Fishery Technology Development and Transfer Bureau, Coastal Aquaculture Research and Development Bureau, Marine Fisheries Research and Development Bureau, Inland Fisheries Research and Development Bureau). For regional administration, there are 75 provincial offices. Each office is responsible for research, analysis and evaluation of fisheries technology to support the fishing industry; issue of certificates in accordance with fishing laws and regulations; surveillance of aquatic animals breeding; and provision of knowledge and services to fishers and employees.

The Department of Fisheries aims to: 'increase quantity and quality of fishery production from both capture fisheries and aquaculture to meet domestic demands and international requirements; manage fisheries resources in a sustainable manner by fishers, local communities and organisations and the government; accelerate research in supporting aquaculture to increase the quality of production and to reduce production costs; have fishers and local organisations participate in fisheries management and development in line with the overall decentralisation trend in Thailand; increase knowledge and skill of fishers to maintain their self-reliance and manage their organisations; control and regulate fishing operation in compliance with agreements with other coastal States or joint-venture partners; and maintain the status of Thailand as one of the top fish producing and exporting countries.'[27] These aims, if successfully achieved, would result in the sustainable management of Thai fisheries. The Department of Fisheries, however, needs to seek for cooperation from other agencies to achieve these goals.

In order to successfully control fishing capacity in Thai waters, the effective cooperation from the Marine Department in terms of the vessel registration controls is required. Marine Department, which is under the Ministry of Transport, is a core government agency who enforces the *Thai Vessels Act B.E. 2481 (1938)*[28] that governs all types of vessels in Thai waters, including fishing vessels.[29] The structure of Marine Department is presented in Figure 7.2. To control the number of registered fishing vessels as at the optimum level for sustainable state of marine resources, the Department of Fisheries and the Marine Department are required to cooperate very closely. However, their present cooperation is unlikely sufficient as the new fishing vessels equipped with restricted fishing gears, which has been frozen in number by the Department of Fisheries can still be built (e.g., trawler). This is occurred due to the fact that Thai fishers can build a vessel and apply for fishing vessel registration at Marine

[27] OECD, *Review of Fisheries in OECD Countries 2009: Policies and Summary Statistics* (OECD, 2010) 402.

[28] Details of this Act can be viewed in Section 2.4.1 of Chapter 2.

[29] Mission of the Marine Department include: '(1) to enforce the *Navigation in Thai Waters Act*, *Thai Vessels Act*, *Prevention of Ship Collision Act*, *Mercantile Marine Promotion Act* and other relevant laws; (2) to conduct the study for the development of water transport infrastructure; (3) to regulate water transport and shipping industry; (4) to cooperate and coordinate with relevant local and international agencies and organisations in the field of water transport and shipping industry including agreements and international conventions; and (5) to carry out other work entrusted by law or the Ministry of Transport or the Cabinet.'

Department without any approval from the Department of Fisheries. The Department of Fisheries are empowered to govern only the types and number of fishing gears (i.e., fishing license). Such big loophole has resulted in uncontrolled number of Thai fishing vessels, both operating within and outside Thai waters.

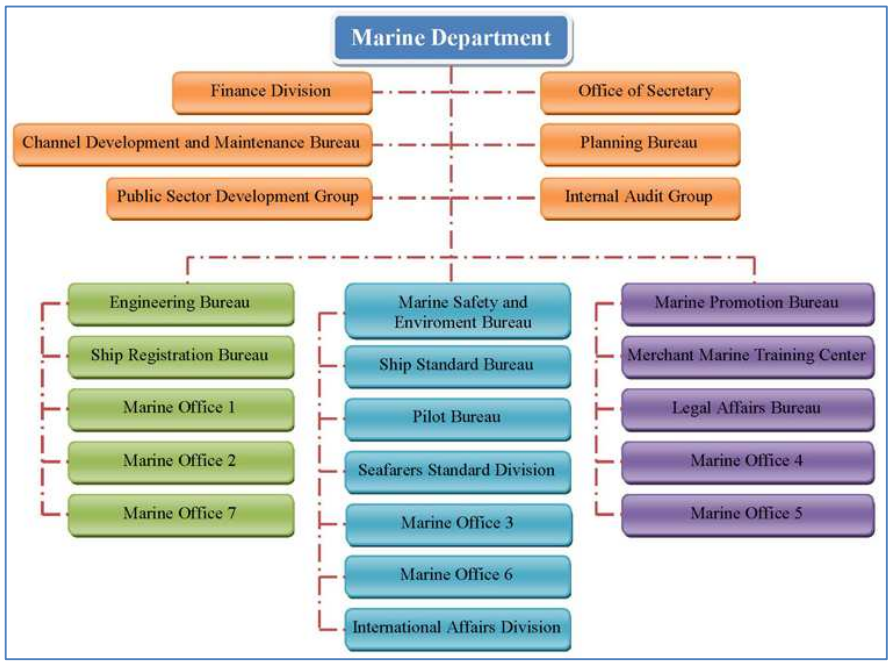

Figure 7.2: Organisation Chart of the Marine Department

Source: Marine Department, Organisation Chart (2006) <http://www.md.go.th/eng_page/organisation_eng.php>.

Apart from the inadequacy of cooperation between central government agencies, the insufficiency of cooperation between local government organisations and fisheries communities are also found, particularly where CBFM systems are implemented. As mentioned earlier in this chapter, local government organisations, particularly Tambol Administrative Organisation, are often found inactively participate in the implementation of fisheries management measures in their areas. NGOs, on the other hand, tend to work independently with fisheries communities without seeking cooperation from local authorities. The lack of cooperation among relevant organisations and authorities will certainly lessen the effective outcome of the management measures implemented.

7.2.6 Lack of Solid Political Will on Fishing Capacity Reduction

Although the current policy of the Department of Fisheries is now put forward to the direction of decentralization and fisheries community participation, it still appears to be fisheries productivity orientation. It is because one of the main targets set by the Master Plan is to maintain the annual production of marine capture fisheries as at 1.7-2.0 million tonnes consisting of at least 80 per cent of commercial species from Thai waters, and 1.0-1.6 million tonnes from overseas fisheries by Thai fishing vessels. Therefore, it is very challenging to harmonise this target with the policy of capacity reduction that Thailand also needs to urgently put in place. Furthermore, the decisions made by the policy makers in granting amnesty to illegal trawlers several times in the past have already shown the contrast view. It is likely that fishing capacity reduction is not favourable issue for politicians to advocate. As long as there is an absence of political commitment on capacity controls in Thai fisheries, the problem of overcapacity remains and tends to be worse.

7.2.7 Inadequacy of the Application of Relevant International and Regional Instruments

To adopt the relevant international and regional agreements, as well as cooperate with other States through regional fishery organisations or arrangements in order to address overcapacity problem is also an important action. Thailand has adopted and implemented a number of international and regional instruments as presented in Table 7.1. Nonetheless, Thailand has not yet been a party of the *1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas* or the *FAO Compliance Agreement*, and the *1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* or the *1995 Fish Stock Agreement*. These two legal binding instruments are considered as the fundamental tools to control fishing capacity on the high seas. Especially the *1995 Fish Stocks Agreement*, it clearly requires States to implement measures to deter or get rid of overfishing and excess capacity and ensure that the level of fishing effort does not exceed the suitable level for the sustainable utilisation of fishery resources on the high seas. This statement

can be taken as the principle of fishing capacity management on the high sea and should therefore be adopted by any States who fishing on the high seas, particularly where there is the absence of strong regulatory framework to control fishing capacity. Hence, Thailand, as a distant-water fishing nation, should seriously consider ratifying the *1995 Fish Stock Agreement*, as well as the *FAO Compliance Agreement* in order to jointly control the fishing capacity on the high seas with other States.

Table 7.1: Summarize of the status of Thailand in ratification or accession of relevant international and regional instruments on fishing capacity management

Instruments	Legal Status	Status of Thailand	Date of Ratification/ Accession
The 1982 United Nations Convention on the Law of the Sea	Legally Binding	Party	15/05/2011
The Agreement Relating to the Implementation of Part XI of the Convention	Legally Binding	Party	15/05/2011
The 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas	Legally Binding	*Not Party*	
The 1995 Agreement for the Implementation of the Provision of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	Legally Binding	*Not Party*	
The 1995 Code of Conduct for Responsible Fisheries	Voluntary Basis	Adopted	
The International Plans of Action for the Management of Fishing Capacity	Voluntary Basis	Adopted	
SEAFDEC Regional Code of Conduct for Responsible Fisheries	Voluntary Basis	Adopted	
Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region	Voluntary Basis	Adopted	
Conservation and Management Measures of the Indian Ocean Tuna Commission	Legally Binding	Party	17/03/1997

7.2.8 Difficulties for Thai Fishing Fleets in Overseas Fisheries

Due to the severe problem of overcapacity in national waters, the Thai government, by the Department of Fisheries, has encouraged and supported Thai fishers to go fishing overseas. But, there is a number of constraints that Thai fishers have faced as follows:-

(i) Difficulties in arranging fisheries contracts to exploit other States' fishing grounds: it is because most States have established marine resource conservation initiatives that brought about the cancellation of foreign boats' fishing contracts, particularly trawlers which are considered as a destructive fishing gear;

(ii) Lack of cooperation among Thai distant fishing fleets: Thai distant fishing fleets generally obtain fishing contracts through different arrangements involving the private sectors. Therefore, they tend to compete with each other for resources in the same fishing grounds. This situation facilitates the host States to stipulate any conditions to Thai fishing fleets;

(iii) Independent roles played by government agencies: to manage Thai distant fishing fleets effectively, compliance with a number of laws implement by various government agencies is required. However, since those agencies work independently, effective management is hardly achieved. For instance, Thai fishers can build a new vessel for overseas fisheries and have it registered as a fishing vessel at Marine Department without any consent of the Department of Fisheries. This causes the difficulties in controlling and governing Thai fishing vessels operating in overseas or on the high seas. IUU fishing possibly conducted by these vessels could also be uncontrolled; and

(iv) Incapability of Thai distant fishing fleets: majority of Thai fishers are not capable to go fishing on the high seas due to the lack the necessary technology and experiences. Moreover, going to fish overseas will require high operational cost, which most of Thai fishers may not be able to afford.

Thus, in order to support Thai fishing vessels to operate overseas successfully, the above challenges need to be addressed in an appropriate way.

7.3 Options and Recommendations for Thailand to Effectively Manage Fishing Capacity

Based on the analysis and discussions aforementioned, it can be seen that although Thailand has put great effort to control their fishing capacity, several gaps and challenges in terms of national legislation, institution and technical support are still found. Options and recommendations for Thailand to adopt in order to overcome these constraints are proposed in the following sections.

7.3.1 Reformation of the Fisheries Laws and Regulations

According to the discussions distributed in earlier chapters,[30] *the Fisheries Bill B.E. 2555 (2012)* that has become the new *Fisheries Act B.E. 2558 (2015)* contains a number of new provisions supporting the effective management on fishing capacity. The remarkable provisions under this Bill are, for instances, setting up three fishing zone establishment, namely coastal fisheries zone, offshore fisheries zone, and freshwater fisheries zone,[31] and supporting regulations imposed in particular fishing zone;[32] encouraging the participation of stakeholders, particularly local fisheries communities, on rehabilitation, conservation, management, and sustainable utilisation of coastal marine resources;[33] and imposing more reasonable penalties for all fisheries violations.[34]

Additionally, this Bill includes the provision concerning the determination of Total Allowable Catch (TAC) in Thai waters in order to harmonise the *LOSC*.[35] This legal arrangement can be considered as the first attempt of Thailand in putting output control measure into the legislation. The TAC would later be translated into the appropriate number of fishing licenses for particular fishing gears/vessels. Clearly, the new *Fisheries Act* will be the fundamental legislation for modern fisheries of Thailand.

[30] For examples, Section 2.4.2 of Chapter 2, Section 4.3.1.1.3 of Chapter 4, Section 5.2.3 of Chapter 5, Section 6.2.1 and 6.2.2 of Chapter 6.

[31] *The Fisheries Bill B.E. 2555 (2012)* art 29.

[32] *The Fisheries Bill B.E. 2555 (2012)* art 33-37.

[33] *The Fisheries Bill B.E. 2555 (2012)* art 8.

[34] *The Fisheries Bill B.E. 2555 (2012)* art 71-85.

[35] After the ratification on the *LOSC* on 15 May 2011, Thailand has been under the process of reviewing the relevant legislations and reforming them in line with the *LOSC*.

However, the only fundamental legislation is definitely insufficient to effectively managing fishing capacity in Thailand. Coordinate legislation, e.g., the Ministerial Notifications, are needed to support the new *Fisheries Act* in order to facilitate the implementation of effective measures for managing of fishing capacity and addressing the gaps and challenges discussed in Section 7.2. Such management measures and activities incorporating with the required legislation are proposed for Thailand in the following subsections.

7.3.2 Reduction Program of Fishing Vessels and Fishing Gears

Obviously, Thailand has already had a severe problem of overcapacity in marine fisheries. The immediate action that Thailand should seriously take for fishing capacity reduction is to reduce the number of fishing vessels and fishing gears currently operating in Thai waters (both legally and illegally). This action should be started by strictly freezing the number of registered fishing vessels, particularly destructive fishing vessels (e.g., trawlers, push netters) as at the present level. Later, the appropriate management measures, such as limited licensing and/or buyback schemes, will be implemented to withdraw the excess capacity from fisheries by fishing gear type. Nonetheless, based on the discussion in great details in Section 4.3.1.1.1 of Chapter 4, Thailand has made a number of attempts to implement buyback scheme in trawl and push net fisheries with undesirable outcome. Many rounds of amnesty granted to illegal trawlers demonstrated the failure of such measure implemented.

To address this issue more effectively, Thailand needs to implement a better designed limited licensing program, together with the follow-up activities. For example, after Thailand measured the existing level of fishing capacity and analysed the optimum level of fishing capacity that is commensurate with the current status of marine resources, Thailand should determine the level of excess capacity of particular fisheries (i.e., small-scale and large-scale fisheries) and fishing gears (e.g., trawlers, push netters, purse seines, gill nets, traps) that must be removed from the fishery industry. Removing such fishing capacity, however, must take into account a number of actions.

First, it is essential to assess the status of species stocks in order to know which species or group of species are currently harvested beyond the biological reference point, i.e.,

MSY, as these species are needed to be urgently managed. Therefore, the MSY of key species or group of key species and the optimum level of fishing effort for such MSY must be prior determined. Second, it is also important to know what are the main fishing gears for particular key species and what is the current level of its capacity (i.e., number of fishing gears and fishing vessels by sizes, number of fishing days). Subsequently, the level of excess capacity for particular species must be evaluated and removed from the fisheries. Such capacity reduction can be in terms of a number of fishing vessels that must be removed, or a number of fishing days that must be reduced. A fleet reduction program of such certain fishing vessels and fishing gears will then be established accordingly. The goal and timeframe of the program must be indicated (e.g., the number of trawlers aimed to reduce within each year of the project). The evaluation of the project must also be conducted.

Indeed, the compensation paid to the fishers who must leave the fisheries is unavoidable, either through the establishment of an investment fund or a buyback scheme. In terms of buyback program, the benefits and expenses of program depend on what types of fishing vessels to buy out of the fisheries. Buying large-scale vessels would probably provide more significant benefits than buying small-scale vessels, which are majority of Thai fisheries, since the operational costs are lower. Furthermore, buying out small-scale vessels from the fisheries might cause a big controversial in terms of socio-economic issue as small-scale fisheries are basically considered as subsistence fisheries. The compensation money for the owner of legal fishing vessels who have to leave the fisheries might obtain from various ways. For instance, it could be shouldered solely by the government or by the remaining fishers as they would technically gain the benefits from the increased catch due to the less number of competitors over marine resources. The compensation expense could also be shared between the government and remaining fishers. Nonetheless, it is crucial that the action plans of fleet reduction program, particularly in terms of the mechanism for selecting participants and for paying compensation, must be concluded and agreed by stakeholders before starting the program. For example, there should be a condition that only legal fishing vessels can participate the reduction program, and illegal fishing vessels must be removed from the fisheries without any compensation. Furthermore, in order to ensure the permanent removal of such excess fishing gears and vessels, they must be removed from the fisheries database and, if it is feasible, should be scrapped as

well. This action aims to protect them to return to fishery industry, which has been a main issue of the failure of previous buyback programs in Thailand.

To facilitate all activities aforementioned for a fleet reduction program, a number of legislation must be issued. For instance, the Notifications or regulations that require the determination of TACs and correspond fishing effort for key species or group of species (i.e., demersal species, pelagic species). In this sense, the assessment of the biological reference point (i.e., MSY) of key species and/or group of key species must be put in the national policy of competent authority (i.e., the Department of Fisheries). Additionally, the Notifications or regulations that specify the limits of allowed fishing gears and vessels, in terms of number and sizes by types, must be declared. Later, the legal framework for governing the mechanism of fleet reduction program can be established.

However, based on the discussions in Chapter 4-6, it has clearly demonstrated that one single measure cannot solely solve overcapacity problem in Thailand. Combining limited licensing program with other management measures, i.e., gear and vessel restrictions, closed season and closed areas, and CBFM, are therefore crucial. Strengthening MCS system, which often found weak in Thailand, is certainly a key of the success of the implementation of these measures.

7.3.3 Promoting and Strengthening Community-based Fisheries Management in Thai Fisheries

Undoubtedly, using MSY (or MEY) as a reference point can be applied in capacity management of multi-species fisheries.[36] But, harvest strategies for multi species are needed to determine in conjunction with each particular species. Given the different biology and economic characteristics of different species, it is likely to compromise the profits of different species. The accuracy of data collection is also a success key in the implementation of this measure. Developing countries where having tropical multi-species fisheries, like Thailand, may have difficulties in providing financial support to

[36] Some developed countries, such as Australia, use MEY as a reference point for individual harvest quota system applied on multi-species fisheries with the successful outcome. See, Anthony D M Smith et al, 'Experience in Implementing Harvest Strategies in Australia's South-eastern Fisheries' (2008) 94(3) *Fisheries Research* 373.

cover all ranges of activities required in setting and evaluation the TACs for harvest quota system. CBFM could be considered and simultaneously promoted as an management measure. Having said this, the CBFM implemented in Japan[37] could be a good model for fisheries management in Thailand. Nonetheless, it is important to note that economic, social and political conditions in these two States are quite different and thus implementing Japanese model in Thai fisheries context should be carefully done. Another issue needed to concern is how to implement the CBFM system in a way that it can be self-organised by fisheries community. In most cases, the CBFM projects could not be sustained after the assistance provided by government or organisations was finished. This is a key factor of the success of CBFM implementation. Further, high participation of fisheries communities and other resources users, effective cooperation among stakeholders, establishment user rights and legal authority to fisheries communities, institutional arrangements and strong political will from both national and local levels are also the keys of successful outcome of the CBFM system.

To tackle the above issues, the Thai government by the Department of Fisheries proposed the new *Fisheries Act*, which contains the provisions facilitating the CBFM concept. The significant provisions are those concerning the requirement to establish the Provincial Fisheries Committees, which also include the representatives of fisheries community associations. These committees will submit a fishery policy or management and conservation measures for their areas of competence to the National Fisheries Policy Committee and the Minister to consider. Furthermore, representatives of fisheries community associations can be empowered by the Minister to govern their areas in accordance with the new fisheries law. However, it is important to ensure that the criteria for the selection of committees, both at provincial and national levels will be able to obtain appropriate representatives, who can carry out their tasks effectively. Also, the balance of such representatives has to be carefully considered. With inequitable arrangement, the controversy in terms of unequal participation of fisheries sectors (e.g., small-scale and large-scale sectors) in preparing the policy of fisheries development in Thai waters could be arisen.

[37] Details are already discussed under Section 5.2.3 of Chapter 5.

7.3.4 Promoting the Formation of Fisheries' Cooperatives and/or Organisations

Clearly, Thailand needs to adopt the more effective measures for capacity management, particularly by implementing the right-based management and limited access in fisheries. To facilitate these management measures, the legislative framework on the formation of fisheries' cooperatives and/or organisations must be soonest developed. The new legislation (e.g., Fisheries Cooperative Law) will empower fisheries cooperatives and/or organisations in fisheries management and marine resource conservation and rehabilitation. In addition, the property right for fisheries resources must be clearly defined and open access fisheries or regulated open access fisheries must be replaced with regulated access fisheries. Based on the findings under Section 5.2.3 of Chapter 5, Thailand may take Japan as a good example in arranging legislative framework for fisheries cooperatives. To support this legal arrangement, however, the Department of Fisheries should require all fishers and/or existing fisheries groups to register and operate as cooperatives or organisations, as well as assist them to build-up the necessary skills needed for operation.

At present, the cooperatives in the fisheries sector of Thailand are already established by the fishers nationwide[38] with the main purposes of fixing their fishing and marketing problems through collective buying and selling, giving loan to members, promoting sustainable fisheries and conserving natural resources. Nonetheless, they are not yet granted any legitimate power to manage the fisheries in their areas.[39]

7.3.5 Promoting Closed Seasons and Closed Areas

Thailand has implemented closed seasons and closed areas both in the areas of the Gulf of Thailand and the Andaman Sea for the main purpose to conserve the important marine stocks of Thailand, particularly the stocks of Indo-Pacific mackerels. These

[38] As of 2014, Thailand has 71 fishery cooperatives with a total of 12,035 members. These fishery cooperatives can be grouped as: (i) marine fishery cooperatives: there are 23 cooperatives with 4,111 members who are large-scale fishers (overseas fisheries), medium-scale fishers (off-shore fisheries) and small-scale fishers (coastal fisheries within 3,000 metres from shore); (ii) brackish water cooperatives: there are 15 cooperatives with 5,547 members, consisting of shrimp farmers, fish farmers and shellfish farmers; and (iii) freshwater cooperatives: there are 34 cooperatives with 5,547 members, comprising freshwater fin fish and shellfish farmers and other aquatic animal farmers.

[39] To some extent, the new *Fisheries Act* has addressed this issue.

closures take place in the area of 26,400 square kilometres along the Gulf of Thailand within Prachuab Kirikhan, Chumphon and Surat Thani Provinces (annually closed during 15 February to 15 May), and the area of 4,696 square kilometres along the Andaman Sea within Krabi, Pang-nga, Phuket and Trang Provinces (annually closed during 1 April to 1 June). Based on the scientific researchers conducted before and after the period of these closures by the Department of Fisheries, the results have suggested the positive impact of this measure on both marine stocks and fishers' income.[40] Later, Thailand has expanded the closed area to the inner Gulf of Thailand. This new closure is located within Samut Sakhon, Samut Prakan, Samut Songkhram, Phetchaburi, Prachuab Kirikhan, Chachoengsao, Chonburi, Provinces, with a total area of 4,900 square kilometres, and applied during 1 June to 31 July every year (started in 2014). This new closed area is also established to conserve Indo-Pacific mackerel stock as this area is another important nursery ground of such species. However, as greatly discussed under closed seasons and closed areas section in Section 6.2.3 and 6.2.4 of Chapter 6, the impact of these measures on capacity reduction may not be fully obtained as they do not adjust the incentive to harvest fish of fishers. Fishing vessels can still go to operate elsewhere while waiting for these areas opened. This issue, however, could be addressed by only allowing fishing vessels to operate in their assigned area, i.e., only in the Gulf of Thailand or the Andaman Sea. The code and colour marking scheme must accordingly be introduced to differentiate the fishing vessels based on their fishing grounds, particularly the large-scale fishing vessels. In this case, closed seasons and closed areas would provide more benefits to Thai fisheries in terms of capacity controls.

Expanding conservation areas along the coastline or 'Coastal Belt' is another practical option for Thailand to push forward. Presently, Thailand has made the effort to expand such 'Coastal Belt' from three kilometres to three nautical miles offshore and got successful results in a number of provinces.[41] As a follow-up activity, the new *Fisheries Act* provides three fisheries zone establishment, including coastal fisheries zone covering three nautical miles from the shoreline and to a limit not over 12 nautical miles, which will theoretically expand the Coastal Belt nationwide. Nonetheless,

[40] Details of closed seasons and closed areas implemented by Thailand can be viewed in Section 6.2.4 of Chapter 6.

[41] They are Trang, Krabi, Prachuab Kirikhan, Rayong, Narathiwat, Pattani, Satun and Nakhon Si Thammarat Provinces.

appropriate fishing capacity management within new zones, particularly coastal and offshore fisheries zones, are needed to carefully determine. For instance, the determination on types and amount of fishing vessels or gears allowed to operate in each zone is essential to carry out. Fishing vessels or gears operating in different zone should be clearly distinguished, by implementing the code and colour marking scheme.

Although the measures of closed areas and closed seasons may not be the best option in terms of capacity controls in Thai fisheries, they can still be used as supplementary measures. Implementation of these measures will be useful to where having difficulties in implementing other capacity controls as it has already been proofed that these measures are accepted by Thai fishers. Nonetheless, it must be aware that the support of strong scientific evidences is crucial when implementing this type of measures.

7.3.6 Improving and/or Developing Data Collecting System

The accurate, comprehensive, and updated databases of fisheries data, including fishing vessels, fishing gears and state of marine resources (e.g., catch production, CPUE), are truly essential for managing capacity management in any fisheries. For example, to analyse the MSY it will need a time series of reliable catch data (at least 10 years) and updated CPUE data (at least five years) of concerned marine species. Furthermore, in order to manage the level of fishing capacity effectively, the accurate number of existing fishing vessels and fishing gears must be obtained.[42] Besides, the relevant information, such as the current number of fishers and people involved in fishery industry, the total number of fishing ports or landing sites, must be gathered.[43] Thus, Thailand needs to improve and/or develop its data collecting system to facilitate the implementation of the management measures for controlling fishing capacity. Such system should be established in the way to harmonise with the international standards for the purposes of sharing, exchanging information and collaboration between countries.

In order to make such arrangement, financial support is definitely required from the Thai government, which could be an issue due to the budget constraint. Seeking

[42] The annual fisheries statistics of Thailand is always issued late, few years behind.

[43] The latest marine fisheries census of Thailand was done in 2000.

financial assistances from available donors (e.g., Asian Development Bank) or conducting collaborative project with other agencies, such as SEAFDEC or FAO, could be carried out to address this issue.

7.3.7 Strengthening Monitoring Control and Surveillance System

It is recognised that an effective MCS system is essential for achieving the success in controlling fishing capacity. According to the discussion in Section 7.2.4 above, it was found that Thailand has an inadequacy of MCS system and needs to have it strengthened. However, due to the financial constraint, Thailand may not be able to improve MCS system by substantially increasing either manpower or patrol boats in order to cove the long coastline of the country. To address this problem under limited budget conditions, law enforcement could be strengthened by empowering fisheries communities to exercise the authority in their coastal areas. In this sense, a legitimate power needs to be granted to them in an appropriate way. The legislation that provides this arrangement must therefore be put in place. The new *Fisheries Act* has attempted to address this issue by empowering the Minister of Agriculture and Cooperatives Ministry to appoint the representatives of fisheries community associations as the fisheries officers' assistants to enforce the Act,[44] including in terms of MCS. Thailand, however, must further issue the legal arrangement that provides the procedure of conducting MCS activities by the fisheries community associations.

Using technology is another option to improve MCS system in Thai fisheries. VMS has recently been introduced to Thai fishing vessels (e.g., trawlers) by the Department of Fisheries through a pilot project with a goal to improve MCS system by using available technology. But, using this system is quite costly and needs high maintenance from users. Fishers may be reluctant to adopt this technology by voluntary basis. Thus, the fisheries law should require the VMS installation on large-scale fishing vessels, such as trawlers and purse seines, in order to monitor and control their fishing operation. However, as applicable fishers would probably have difficulties to comply with such rule due to the high operational cost, the government or fishery industries may need to provide the financial support for VMS installation.

[44] Details are discussed under Section 5.2.6 of Chapter 5.

Seeking cooperation from neighbouring countries of Thailand could be considered as an option to strengthen MCS system, particularly in border areas. Nonetheless, to achieve such option will need appropriate arrangement between the Thai government and concerned government(s). The Association of Southeast Asian Nations (ASEAN) could be the channel in seeking this kind of cooperation among countries in Southeast Asian region.

7.3.8 Strengthening Cooperation among Relevant Agencies and Stakeholders

Due to the discussion under Section 7.2.5 above, it can be concluded that more effective cooperation among government agencies, particularly between the Department of Fisheries and the Marine Department, is essentially required in controlling fishing capacity, particularly in terms of fishing vessels control. These two agencies should together set up a working plan in controlling the number of registered fishing vessels as at the appropriate level with the level of sustainable fisheries resources. For example, both agencies should set up a regulation that requires fishers to firstly obtain a fishing license from the Department of Fisheries before applying for a permit to build a new fishing vessel from the Marine Department. Therefore, the numbers of fishing gears and fishing vessels are both controlled accordingly. However, it is essential that the competent officers must ensure the accuracy of required information, e.g., type, size and number of fishing gears or size of fishing vessels, before granting a fishing license or a vessel permit. Besides, cooperation on field between these two agencies, such as establishing a mobile unit for renewing fishing licenses and vessel permit, should be developed to not only facilitate the fishers in remote areas but also be able to obtain the updated data of fishing vessels and fishing gears. A memorandum of understanding (MoU) for interagency information exchange between the two agencies should also be established.

At the local level, closer cooperation among Tambol Administrative Organisations, non-government organisations (NGOs), and fisheries communities are truly required to sustainably achieve the success of fisheries management in their areas. Tambol Administrative Organisations should actively support the implementation of fisheries management measures within their responsible area, whereas NGOs should seek for

cooperation from not only fisheries communities but also local government agencies when implementing fisheries projects in the areas.

Additionally, the Provincial Fisheries Committee (PFC) has been formed in all provinces to take action on fisheries issues arisen within fisheries communities in competent area. The committee is composed the Provincial Governor (Chair) and representatives of the Marine Department, the Office of Industrial Affairs, the Local Fisheries Association (both small-scale and large-scale fisheries), the Department of Fisheries, and other relevant organisations. This committee is expected to play significant role to build cooperation on addressing fisheries issues at provincial level. However, it is likely that such role is insufficiently performed in some certain areas, and thus it needs to be strengthened.

7.3.9 Developing and Implementing Thailand National Plan of Action for the Management of Fishing Capacity

While the amendment of existing legislation suggested above would provide a better legal arrangement for fishing capacity controls, an integrated single policy, which is developed by focusing on a wide range of issues on fishing capacity management of both small-scale and large-scale fisheries, is still required. It is called Thailand National Plan of Action for the Management of Fishing capacity (*Thailand NPOA-Capacity*). The NPOA must provide the policy guidelines and action plans for stakeholders (e.g., fishers, fisheries communities, fisheries organisations, local government organisations, and central government) in implementing the measures to deter or eliminate excess capacity and ensure that the current level of fishing effort is commensurate with the state of marine resources in Thai waters. In this sense, such NPOA should be developed by seriously considering the criteria analysed from relevant international and regional instruments (Section 3.4 of Chapter 3). Therefore, as aforementioned in Section 7.3.2, Thailand should precisely measure its current fishing capacity as soon as possible, both in small-scale and large-scale fisheries. The obtained capacity must be accessed whether it is larger than the optimum level for sustainable fisheries. Thus, Thailand must determine a reference point for the optimum level of fishing capacity that will be used to evaluate. The appropriate measures or approaches will be subsequently designed and implemented to rectify the level of fishing capacity. However, the success of NPOA

implementation will heavily depend upon the commitment from relevant ministries and local governments, to endorse and accept this plan as the principle national guideline and policy for fishing capacity management. The cooperation of other stakeholders is also essential.

7.3.10 Encouraging Overseas Fisheries

As stated in Section 7.2.8 above, in conducting overseas fisheries Thai fishers have experienced the problems both in terms of technical issues (e.g., lack of necessary knowledge and technology) and fishing arrangement issues (e.g., difficulties in obtaining reasonable contract, lack of cooperation among relevant government agencies and among fishers). If these problems are overcome, supporting Thai fishers to legally operate overseas fisheries in available fishing grounds can be a good option to address overcapacity problem in Thai waters. To tackle these problems, however, the Thai government needs to take more effective actions, both in terms of authority exercising (e.g., seeking for overseas fishing arrangements with host countries, such as joint venture arrangements, and facilitating Thai fishers in signing contracts; promoting overseas fisheries by levying tax for Thai fishers; governing Thai fishing vessels to operate overseas in a sustainable manner) and capacity building (e.g., providing Thai fishers the necessary knowledge and training with regard to relevant international laws and regulations, and relevant measures of the international standards for safety at sea).

Apart from supporting Thai fishing vessels to legally operate in neighbouring States' waters, the Thai government should also consider participating in more regional fisheries management organisations (RFMOs),[45] particularly where Thai fishing vessels have capability to go fishing in their areas of competence. New fishing grounds in the Indian Ocean and the Pacific Ocean should be considered by the Thai government and the fishers. Overseas fishing arrangements are not only the possible solution for overcapacity problem in Thai waters, but also the opportunities for Thailand to access foreign markets, which will definitely benefit the fisheries industry of the country.

[45] Currently, Thailand is a member of the Indian Ocean Tuna Commission (IOTC) and a cooperating non-member of the Western and Central Pacific Fisheries Commission (WCPFC).

7.3.11 Ratifying the *FAO Compliance Agreement* and the *1995 Fish Stock Agreement*

Apart from reformation of national legislation in order to facilitate and support fishing capacity management in the country, Thailand should also ratify and adopt applicable international and regional instruments in order to manage its fishing capacity in accordance with international standards. Further, to some extent, these instruments will provide an applicable framework for Thailand to control its fishing capacity outside the national jurisdiction, especially fishing capacity on the high seas. Therefore, Thailand should strongly consider ratifying the *FAO Compliance Agreement* and the *1995 Fish Stock Agreement* that provide a legal framework for States to govern the control over its fishing vessels operating on the high seas.[46]

7.3.12 Building Strong Political Will in Capacity Reduction

The strong political will to push forward the policy on capacity reduction is an essential factor to ensure the successful result of the implementation of fishing capacity management in Thailand. Most importantly, the policy makers must recognise that overcapacity problem is a direct consequence of free and open access fisheries and should carry out the management of fishing capacity in this context.[47] Policy makers should therefore provide a strong effort to support the implementation of capacity controls in Thai fisheries. In this regard, setting the explicit reference point of capacity reduction must be seriously considered by the policy makers. The Department of Fisheries should continue conducting researches in order to obtain necessary scientific information (e.g., the state of marine resources) and relevant data[48] required to support policy makers in making appropriate decisions on fishing capacity management.

[46] Applicable provisions under these two international instruments are already discussed in Section 3.2.1.2 and 3.2.1.3 of Chapter 3.

[47] Steve Cunningham and Dominique Greboval, *Managing Fishing Capacity: A Review of Policy and Technical Issues* (FAO, 2001) 16.

[48] They include, for example, the data of catch production, CPUE, number of fishing vessels/gears.

7.4 Conclusion

Firstly, this chapter analysed and identified the gaps and challenges in managing fishing capacity in Thai fisheries. The analysis was done in the areas of legal, institutional and technical support aspects. Such gaps and challenges included the topics of 'outdated, impractical and inadequate legal arrangements supporting the management of fishing capacity', 'lack of proper technical supports in setting the sustainable reference point', 'inadequacy of effective measures used to manage fishing capacity', 'inadequacy of monitoring control and surveillance system', 'insufficient of cooperation among relevant agencies', 'lack of solid political will on fishing capacity reduction', 'inadequacy of the application of relevant international and regional instruments' and 'difficulties for Thai fishing fleets in overseas fisheries'.

In order to address these gaps and challenges identified, the second part of this chapter provided possible options for Thailand to take for the achievement of effective fishing capacity management. These options included 'reformation of the fisheries laws and regulations', 'reduction program of fishing vessels and fishing gears', 'promoting and strengthening community-based fisheries management in Thai fisheries', 'promoting the formation of fisheries' cooperatives and/or organisations', 'promoting closed seasons and closed areas', 'improving and/or developing data collecting system', 'strengthening monitoring control and surveillance system', 'strengthening cooperation among relevant agencies and stakeholders', 'developing and implementing Thailand National Plan of Action for the Management of Fishing Capacity', 'encouraging overseas fisheries', 'ratifying the *FAO Compliance Agreement* and the *1995 Fish Stock Agreement*', and 'building strong political will in capacity reduction'.

However, it is essential to note that the only single solution is not capable to solve the problem of overcapacity, Thailand, therefore, needs to appropriately combine and adopt a number of solutions together, which will be varied depending on particular circumstances.

CHAPTER 8 CONCLUSION

Overcapacity is a common problem found in any open access fisheries where the fishers attempt to gain the most benefits. Although there has been increasing awareness in controlling fishing capacity worldwide, the severe intensity of this issue has been growing. Overcapacity mainly results from the fact that States may have limited understanding and ability to measure overcapacity and relevant concepts and/or have not effectively implemented the appropriate management measures to address such problem accordingly. The introductory chapter of the thesis presented the fundamental principles and concepts with regard to capacity in the context of fisheries, such as excess capacity, overcapacity and overfishing. This chapter further summarized the concerns on overcapacity at global level and how this problem has created the impact on the fisheries in Thailand.

Chapter 2 firstly provided the profile of marine capture fisheries of Thailand in terms of catch production, product value and fishing effort. The profile suggested the genuine importance of marine capture fisheries, both conducting in national waters (i.e., the Gulf of Thailand and the Andaman Sea) and beyond national jurisdiction (i.e., other States' EEZs and the high seas) to Thailand. Small-scale and large-scale fisheries profiles showed how marine capture fisheries play a crucial role in socio-economic of the country, as well as how large of the level of current capacity in Thai fisheries is, according to the number of fishing vessels. The indicators of overcapacity (e.g., substantially declining of CPUE) also showed the huge magnitude of overcapacity problem in Thailand. This chapter later discussed the fundamental legislation (e.g., the *Thai Vessels Act B.E. 2481 (1938)* and the *Fisheries Act B.E. 2490 (1947)*) that has governed fishing capacity, particularly fishing vessels, fishing gears in Thailand. With the attempt of Thailand to improve the legislation governing their fishing capacity, both in Thai waters and overseas, the Master Plan for Marine Fisheries Management of Thailand was proposed by the Department of Fisheries. The Master Plan has been adopted and played an important role in managing fishing capacity through the management projects conducted by the Department of Fisheries.

In Chapter 3, the legislative framework on fishing capacity management in the areas under national jurisdiction and on the high seas was analysed by examining applicable

provisions of international and regional instruments. For international instruments, they included both legally and non-legally binding instruments. The former instruments consisted of the *LOSC*, the *Compliance Agreement*, the *Fish Stocks Agreement*, and the WTO Agreement on Subsidies and Countervailing Measures, whereas the latter instruments were composed the *CCRF*, and the *IPOA-Capacity*. In terms of regional instruments, the IOTC Resolutions (legally binding), SEAFDEC Regional *CCRF* and the *RPOA* (non-legally binding) were analysed. Based on the examination, a set of criteria for the management of fishing capacity within and beyond national jurisdiction was developed and summarized. A series of actions derived from the criteria was also suggested for States to follow in order to manage their fishing capacity more effectively. These criteria were subsequently used as a basis to test whether Thailand has adequate arrangements to control their fishing capacity or address the overcapacity problem. The criteria suggest States to conduct the measurement and assessment of their fishing capacity and subsequently implement the appropriate management measures based on the status of their capacity. The fundamental guidance can be concluded that States should implement measures to deter or eliminate overfishing and excess fishing capacity and ensure levels of fishing effort do not exceed those commensurate with the sustainable utilisation of fishery resources. Such measures (i.e., incentive blocking measures, incentive adjusting measures and supplementary management measures), as well as the implication of each measure by Thailand, were then analysed and presented in Chapter 4-6. For Chapter 7, it firstly determined the gaps and challenges in managing fishing capacity of Thailand based on the criteria for fishing capacity management derived in Section 3.4 of Chapter 3, and later proposed the options and recommendations for Thailand to address such gaps and challenges in order to manage fishing capacity more effectively.

Clearly, although Thailand has put great efforts to control and manage its fishing capacity, as demonstrated in Chapter 2 and 4-6, such efforts are inadequate for the huge magnitude of overcapacity problem in Thailand. The gaps and challenges in managing fishing capacity of Thailand can be identified into three main areas, including legal, institutional and management measure aspects. The options and recommendations corresponding to such gaps and challenges are proposed accordingly.

Thailand has the lack of comprehensive legal framework to control and manage its fishing capacity. Current legislation is outdated and insufficient for present fisheries. The principle fisheries law, i.e., the *Fisheries Act B.E. 2490 (1947),* that has been put into force for more than 65 years when overcapacity was not an issue in any fisheries, does not adequately control fishing capacity of Thai fisheries. Although the new *Fisheries Act B.E. 2558 (2015)* has recently been put into force but the coordination laws required for improving the fishing capacity controls have not yet been issued and thus the Ministerial Notifications established under the *Fisheries Act B.E. 2490 (1947)* are still in effect. To address this issue more effectively, however, the necessary coordination laws and regulations need to be urgently developed and put into effect, particularly those that govern and facilitate the implementation of activities and management measures on fishing capacity controls.

The measurement of fishing capacity in Thailand has been conducted and published in terms of national fisheries statistics of the number of registered fishing gears and vessels. These statistics, however, do not cover all types and sizes of fishing gears and vessels because, based on the Thai law, some of them (e.g., vessels less than six GT) are not obliged to register and then not included in the national fisheries statistics. Besides, due to the constraint of human resource and budget, the annual fisheries statistics are always published few years behind the corresponding year. These factors contribute to the difficulties in obtaining the accuracy of existing level of fishing capacity in Thailand. Therefore, Thailand must develop and/or improve its data collecting system to ensure the effectiveness, both in terms of quantity (i.e., covering all kinds of fisheries data) and quality (i.e., ensuring the accuracy and update of fisheries data).

Prior to April 2015,[1] although Thailand has been aware of the overcapacity problem in its fisheries, Thailand has never had a national policy that requires the systematically assessment of the level of excess capacity. One of the main obstacles is the complex nature of Thai fisheries (i.e., multi-species and multi-gear fisheries) that creates difficulties in determining the biological reference point (i.e., the MSY recommended by the FAO), which is essential for capacity assessment. However, Thailand has made a number of attempts to analyse the MSY of some key species, but never applied the

[1] In April 2015, Thailand has received the yellow card from the EU due to the EU's claim that Thailand has inadequately complied with the EU Rules to combat illegal, unreported and unregulated fishing.

results to its fisheries management. It might be because one single species in Thai waters is generally caught with different rate by different types of fishing gears. Therefore, it is unlikely feasible to control fishing capacity of each fishing gear employed on particular species. In this sense, Thailand might consider to analyse the MSY for a group of key species, such as demersal species and pelagic species, and manage the fishing capacity employed on each group accordingly. For example, Thailand can analyse the MSY for a group of key demersal species, and then determine the optimum capacity level, which is corresponding to such MSY. For the determination of current capacity level that harvest demersal species, the current capacity of different types of trawlers and push netters can be used due to the fact that trawlers and push netters are the main fishing gears for demersal species. Based on the capacity evaluation, the excess capacity for demersal species will be derived. Subsequently, the appropriate management measures will be implemented to remove the excess capacity. Fleet reduction program, for instance, should be established, by targeting the removal of trawlers and push netters. However, it is crucial to ensure that the removed trawlers and push netters will not return to fishery industry. To address this issue, scrapping them could be considered as an option. In this case, compensation scheme is also needed to put in place. Therefore, legal and institutional arrangements for facilitating all activities aforementioned are truly required.

Apart from limited licensing scheme (i.e., fleet reduction program), which is considered as an incentive blocking measures, the co-management and CBFM, which are considered as incentive adjusting measures should also be promoted to control fishing capacity in Thailand.[2] The co-management aims that the authorities share some of the resource management powers with user groups, whereas the CBFM means that local resource users, government, other stakeholders and external agents share responsibilities and authorities in managing such fisheries resources. The goal of these measures is to create full or partial, property rights over fisheries resources for users, so that they are willing to harvest the resources within appropriate conservation limits. Thus, overcapacity is expected to be eliminated in the fishery. The fundamental factors needed to consider, particularly when implementing the CBFM, include: ‘how to establish user groups; what rights and responsibilities are being transferred to each user group; how

[2] The discussion on the co-management and CBFM is presented in Section 5.2.5 and 5.2.6 of Chapter 5.

user groups should operate; what mechanism needed to settle the disputes between and within groups; what to do if a group does not represent the best management approach.' Clearly, the legal and institutional framework is required to address these considerations. For Thailand in particular, the government should promote the formation of fisheries' cooperative and/or organisations and share them responsibilities and authorities in managing fisheries resources in their local areas. In this sense, the legislation that supports the formation of fisheries' cooperative and/or organisations (i.e., Fisheries Cooperative Law), and the legislation that grants the legitimate power in managing fisheries resources to such groups must be promulgated. The *Fisheries Act B.E. 2558 (2015)* that requires the formation of the Provincial Fisheries Committees, comprising representatives from government and fisheries community associations, as well as empowers the Minister of Ministry of Agriculture and Cooperatives to appoint representatives of fisheries community associations as the assistants of fishery officers to enforce the *Fisheries Act* can fill such gaps. This legal and institutional arrangement truly supports the implementation of the co-management and CBFM, which is expected to help in addressing overcapacity problem of Thailand. Nonetheless, the coordinate law is additionally required, such as the law for establishing the mechanism needed to settle the disputes between and within groups, and to transfer some enforcement power to user groups.

Another incentive blocking measures, i.e., gear and vessel restriction, and other incentive adjusting measures, i.e., TURFs,[3] taxes,[4] and subsidies[5] are also implemented by Thailand. Gear and vessel restriction scheme in particular, it has been one of the main regulations applied in Thai fisheries for a long time. In terms of vessel restrictions, the significant legislation is the Ministerial Notifications that determining the areas in which trawls and push nets used with motor vessels are prohibited. The areas cover 3,000 metres (or three nautical miles in some provinces) from the coast line and 400 metres surrounding the stationary fishing gears. The Thai government has put the effort to expand these restricted fishing areas nationwide by proposing the provisions under the new *Fisheries Act* to designate three fisheries zones, namely (i) coastal fisheries zone, which is the areas within three nautical miles from shore line or, if appropriate in

[3] TURFs are greatly discussed in Section 5.2.3 and 5.2.4 of Chapter 5.

[4] Taxes are greatly discussed in Section 5.2.7 and 5.2.8 of Chapter 5.

[5] Subsidies are greatly discussed in Section 5.2.9 and 5.2.10 of Chapter 5.

some areas, within 12 nautical miles from shore line; (ii) offshore fisheries zone, which is the areas next to coastal fisheries zone and no further than the areas of national EEZ; and (iii) freshwater fisheries zone, which is fishing areas of freshwater fisheries on land. The new *Fisheries Act* also empowers the Minister of Ministry of Agriculture and Cooperatives or the Provincial Committee in his jurisdiction with the approval of the Minister to issue regulations to govern the fisheries in each fishing zone, such as specifying types, sizes, numbers and components of fishing gears that are allowed and banned in each zone. Regarding fishing gear restrictions, for example, a regulation to ban any fishing surrounding nets having mesh size smaller than 2.5 centimetres to fish at night time, and any fishing gear having mesh size smaller than 2.5 centimetres and used with electricity generators are prohibited in national waters. Nonetheless, the effects of gear and vessel restriction scheme alone on fishing capacity control in Thailand are not significant. It is because not only these fisheries restrictions are mainly designed for the objective of marine resources conservation, but also there is no output controls combined in Thai fisheries. As a result, fishers still have incentives to modify their fishing gears or vessels based on the loopholes of current regulations in order to increase or maintain their catch. However, gear and vessel restriction scheme might provide more effects on capacity control in Thailand when combined with limited licensing schemes.

Supplementary management measures that can indirectly control fishing capacity consist of ecosystem-based fishery and multispecies fisheries management,[6] and closed seasons and closed areas.[7] Particularly closed seasons and closed areas measures, Thailand has implemented these measures for decades with the main purpose of marine resources conservation, and they therefore provide a small effect on fishing capacity control. However, these measures can still be applied as a supportive measure for other fishing capacity controls. In addition, they can be implemented as a primary measure, particularly for where right-based measures are difficult to apply. Thus, Thailand should continue implementing these measures as supplementary measures for managing fishing capacity. Legal arrangement in terms of allocating certain fishing gears for each fishing

[6] Ecosystem-based fishery and multispecies fisheries management are greatly discussed in Section 6.2.1 and 6.2.2 of Chapter 6.

[7] Closed seasons and closed areas are greatly discussed in Section 6.2.3 and 6.2.4 of Chapter 6.

zone (based on the new *Fisheries Act*) would increase the effects of closed seasons and closed areas measures on fishing capacity controls.

ITQ is an incentive adjusting measure that generates the effect of capacity reduction in many fisheries. With the core characteristics of ITQ, including: (i) exclusivity; (ii) durability; (iii) security or quality of title; and (iv) transferability,[8] it is therefore suggested by FAO as the appropriate approach to manage fishing capacity. However, it is unlikely that this scheme can be effectively implemented in Thai fisheries due to not only the difficulties in gathering a large amount of information respecting fishery biology of each target species, which is essential in determination the TAC of each species stock, but also the constraint in terms of enforcement by the authorities, taking into consideration an enormous number of fishing landing sites largely scattering along the coasts of Thailand. However, Thailand, for the first attempt, has put an output control measure (i.e., TAC scheme) into the legislation (i.e., the *Fisheries Act B.E. 2558 (2015)*). The TAC would later be translated into the appropriate number of fishing licenses for each fishing gears/vessels. However, the mechanism for setting TAC and allocating such TAC has not yet been designed. Thus, the legal arrangement for these actions is still needed to put in place.

In addition, Thailand has had a number of other gaps and challenges, including the inadequacy of monitoring control and surveillance system mainly due to the financial constraint; insufficient cooperation among relevant agencies, particularly between the Department of Fisheries and the Marine Department; the lack of solid political will on fishing capacity reduction program; the difficulties for conducting overseas fisheries of Thai fishing fleets; and the inadequacy of the application of international instruments (i.e., the *FAO Compliance Agreement* and the *1995 Fish Stock Agreement*). In order to fill these gaps and overcome the challenges, Thailand should take into account the options and recommendations, including strengthening monitoring control and surveillance system, strengthening the cooperation among applicable agencies and stakeholders, building strong political will in capacity reduction, and ratifying the *FAO Compliance Agreement* and the *1995 Fish Stock Agreement*. More importantly, Thailand must develop the Thailand national plan of action for the management of

[8] Details are discussed in Section 5.2.1 of Chapter 5.

fishing capacity as a comprehensive framework by taking all aspects aforesaid into consideration, and implement it as guidelines for fishing capacity management at the national level.

In sum, it can be concluded that at present Thailand has had the inadequacy of frameworks in legal, policy, institutional and technical arrangement aspects that are needed to effectively manage fishing capacity of marine fisheries. However, as long as all gaps and challenges previously discussed are properly addressed by taking into account the options and recommendations proposed in this thesis, it is likely possible for Thailand to overcome the problem of overcapacity, and therefore the sustainable fisheries will be achieved.

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